Technical Report 1346

Delivering Training Assessments in a Soldier-Centered Learning Environment: Year One

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14. ABSTRACT *(Maximum 200 words)*: The Army Learning Model (ALM) discusses the importance of using valid and reliable assessments in training technologies. It specifically mentions the use of pre-tests to tailor training and post-tests to ensure that learning has occurred to a standard. However, other than these recommendations, the ALM does not address how assessments should be designed, delivered, and otherwise used to maximize Soldier training. Questions regarding which type of assessment should be used, the optimal frequency of assessment and how to automate assessment in collaborative problem-solving scenarios remain to be answered. To address these issues the U.S. Army Research Institute (ARI) developed prototype training that provides a test-bed for conducting research on assessment strategies with maturing training technologies. This paper discusses the development of the prototype training and assessments, including a discussion of the prototype concept, the instructional design approach used to develop the training and corresponding assessments, and the technology considerations and constraints. The paper also describes the results of a beta test that examined the validity and usability of the training platforms and assessments. It concludes with a discussion of future research, which examines critical questions regarding the design and delivery of assessments within the prototype training.

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DELIVERING TRAINING ASSESSMENTS IN A SOLDIER-CENTERED LEARNING ENVIRONMENT: YEAR ONE

EXECUTIVE SUMMARY

Research Requirement:

Soldiers need to be trained to operate in a complex political world, with threats that are more ambiguous and unpredictable than ever before. This context requires Soldiers to be quick learners, both agile and innovative in their thinking. Further, the training the Army provides must fit the needs of Soldiers, who are simultaneously practicing their profession and expanding their understanding of it. Given this complex situation, the Army training environment will be most beneficial when it is adaptable to the learning needs of specific learners, with each working from his or her own personal and professional perspective. The Army Learning Model (ALM) has responded to these challenges by presenting a strong case for a learner-centered approach to training, making use of viable techniques and technologies to support the learning process (U.S. Army Training and Doctrine Command, 2011).

In support of the ALM and given these challenges, the U.S. Army Research Institute for the Behavioral and Social Sciences developed exemplar training using mobile, virtual classroom, and virtual collaborative game-based technologies to deliver Soldier-centered training with integrated assessments. The training prototypes were developed with the goal of supporting research on assessment and training delivery strategies in support of the ALM. This report describes the prototype training and assessments, the methodology used to develop the training prototypes and assessments, the results of a beta test, and the lessons learned from the development process.

Procedure:

The development team used the Analyze, Design, Develop, Implement, and Evaluate (ADDIE) instructional systems design (ISD) approach to develop the exemplar training and assessments. The first step involved selecting and analyzing current training that would serve as the training content for the training prototypes. The selected training concerned the assembly, configuration, programming, and operation of a widely used combat radio, the AN/PRC-148 Joint Enhanced Multiband Inter / Intra Team Radio (JEM). Currently, training on the JEM is conducted over the course of one day at the Signal Regimental Non-Commissioned Officer (NCO) Academy at Fort Gordon, Georgia. In transforming the classroom-based JEM training to mobile, virtual, and collaborative training, the research team proposed a highly integrated approach. Our general concept was that training modules would build upon one another and the assessments would be used to track learning within and between modules. All components were informed by a best practices review that was conducted as part of this project. In addition, the components were coordinated and aligned by an architecture and ISD map. The training and the assessments were created based upon the current classroom training, JEM manuals, and instructor observation. The training content and assessment items were reviewed by subject matter experts (SMEs) on two separate occasions, and assessment items were also content validated. The end result was the creation of training content housed in the respective training

environments (i.e., mobile device, virtual classroom, and game-based collaborative scenario), as well as the creation and use of multiple assessment types (i.e., CAT, checks on learning, and individual and team assessments within the collaborative scenario). The use of these platforms for JEM training was then beta-tested by SMEs at Fort Gordon, GA. Upon completion of each training modality, participants completed an anonymous online survey designed to measure their reactions, specifically, satisfaction with technology, satisfaction with instructional design, satisfaction with learning, utility / transfer beliefs, and enjoyment.

Findings:

Results of the beta-test showed Soldiers' reactions to the prototype training were generally positive. Approximately 80% of participants were satisfied with the training content and rated the instructional design as favorable on the mobile and virtual classroom modalities. Attitudes were less favorable on the collaborative scenario modality – only slightly over 60% of participants indicated favorable reactions to collaborative technology across all items. Further analyses revealed several usability issues that were likely explanations for the lower ratings. These concerns were addressed in subsequent refinements to the training prototypes. Captured lessons learned from the development effort included challenges and strategies for transitioning existing training content into a virtual format and designing assessments for training.

Utilization of Findings and Conclusions:

The prototypes developed for this research program demonstrate how maturing technologies including mobile and virtual learning environments can be used to deliver individual, classroom, and collaborative training in line with the ALM. The prototypes also demonstrate how assessments can be integrated within these technologies to provide targeted feedback and track learning across and between platforms. The prototype training will be used in future research to examine critical issues regarding the use of assessments in a Soldier-centered learning environment. The prototype technologies from this effort have been briefed to representatives at the U.S. Training and Doctrine Command and shared at the Annual Meeting of Society of Industrial and Organizational Psychologists and the Interservice / Industry Training, Simulation and Education Conference.

DELIVERING TRAINING ASSESSMENTS IN A SOLDIER-CENTERED LEARNING ENVIRONMENT: YEAR ONE

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DELIVERING TRAINING ASSESSMENTS IN A SOLDIER-CENTERED LEARNING ENVIRONMENT: YEAR ONE

Introduction

Today's Soldiers face multiple deployments, forward stationing worldwide, and a dynamic geopolitical environment that poses numerous threats that are more ambiguous than ever before. The complexities and challenges of the modern military environment have significant implications for the way Soldiers operate, and in turn, the way they are trained. For example, a dynamic threat environment means that there are ever-changing knowledge and skill sets that Soldiers must master and do so quickly. Varied and rapidly changing operational environments require lessons learned in the field to be adapted quickly in training and education. The implications of these challenges are that the time spent on training and educating Soldiers as well as assessing them must be optimally efficient; training and educational opportunities must be flexible enough to accommodate irregular schedules and heterogeneous environments; and content and delivery methods must be accessible, intuitive, instructionally sound, and incorporate lessons learned in as near to real-time as possible.

As part of the response to these challenges, the U.S. Army Learning Model (ALM) sets forward an agenda for innovation in Army training, where instructor-centered training is replaced by learner-centered training (U.S. Army Training and Doctrine Command, 2011). The ALM focuses on the importance of anytime, anywhere training that has the ability to actively engage trainees, from recruits to retirees, with a learner-centered approach. Rather than limiting training to specific timeframes and locations (e.g., a 'brick and mortar' training environment), the ALM calls for a training system that can be accessed at the 'point of need' and one, "…that extends knowledge to Soldiers at the operational edge, is capable of updating learning content rapidly, and is responsive to Operational Army needs" (U.S. Army Training and Doctrine Command, 2011, p. 16).

A key element of this vision is the use of distributed learning technology to support learning anywhere and anytime. Distributed learning can include synchronous training, such as training in a virtual classroom, and asynchronous training, such as self-directed learning on a mobile device. Research on mobile learning cites a number of potential advantages for mobile learning technology, including more flexible access to training material which can increase learning gains (e.g. Holden & Sykes, 2011; Norris & Soloway, 2004; Roschelle & Pea, 2002; Soloway, Norris, Blumenfeld, Fishman, Krajcik, & Marx, 2001). Further, by shifting training devices into the hands of Soldiers outside the classroom, it contextualizes learning in the real world which situated cognition theory predicts should be beneficial (Lave, 1988).

Training and education literature also discusses the benefits of leveraging videogames and virtual worlds for training environments. Specifically, research shows engagement in either a videogame-based training environment or a virtual world (such as the multi-user virtual environment [MUVE] *Second Life*) can increase trainee motivation and engagement, and thus increase the desire to learn, the desire to practice, and training relevant outcomes (i.e., knowledge or procedural skill) (Chang, Gütl, Kopeinik, & Williams, 2009; Mautone, Spiker, Karp, & Conkey, 2010; Topolski, Leibrecht, Cooley, Rossi, Lampton, & Knerr, 2010). Further,

as a result of their coding architecture, both videogames and virtual worlds have the ability to supply learners with timely feedback with customizable levels of specificity (Mautone et al., 2010). This does not imply that feedback features are native to videogames and virtual worlds. Developing a coding architecture that would allow timely feedback with customizable levels of specificity necessitates a time investment and requires expertise in learning theory, and computer science. However, with an appropriate coding architecture in place, videogames and virtual worlds can provide trainees with or immediate, customizable feedback based on real-time assessment of trainee performance.

In addition to these training platforms, the ALM also mentions the importance of using valid and reliable assessments to ensure learning has occurred to a standard, and as a way to tailor training. The ALM specifically mentions pre-/post-tests as one way to gauge learning, but assessments can be incorporated throughout the training as well. A variety of assessment types beyond traditional multiple-choice tests may be used to assess learning. For example, computer-adaptive tests (CATs) can be used to reduce test length without losing test precision (Triantafillou, Georgiadou, & Economides, 2008). Situational judgment tests can be an effective way to measure more complex application of skill or knowledge, and 360-degree assessments can be helpful in measuring softer, more interpersonal or collaborative skills. Simulated tasks (or "work samples") offer a high fidelity option for measuring performance that can occur at the individual or team level. The ALM focuses on assessing individual learning, but given the Army's emphasis on collective training and performance, assessment of unit-based skills and performance must be considered as well.

The current project focused on creating and testing training and assessment prototypes in support of the ALM. Specifically, the objective was to create prototype technology-based training with embedded assessments for subsequent research. This included an investigation of approaches to training and assessment development and delivery using mobile, virtual classroom, and virtual collaborative technologies. Although the ALM specifies the need for learner-centered, ubiquitous training, the model itself does not specify how training and assessments should be developed, designed, delivered, and otherwise used to maximize Soldier training. Thus, questions surrounding the best way to deliver assessments, the value of using adaptive assessments, and the optimal assessment frequency remain unanswered. This paper discusses the development of the prototype training and assessments, including a discussion of the prototype concept, the instructional design approach used to develop the training and corresponding assessments, and the technology considerations and constraints. The paper also describes the results of a beta test that examined the validity and usability of the training platforms and assessments. It concludes with a discussion of future research, which examines critical questions regarding the design and delivery of assessments within the prototype training.

Throughout the report, we highlight features or methods that were leveraged from a best practices review conducted as part of this effort (see Brusso, Wisher, Paddock & Hatfield, 2014). This review, which focused on the use of assessments in cross-platform, emergent technology training environments, involved a substantive literature review and numerous interviews with subject matter experts (SMEs) who were well versed in developing and integrating training and assessments into technology-based training platforms. The results yielded training exemplars and best practices that showcased how training and assessments could be integrated across

training technologies. Examples of these best practices included applying principles of learning sciences, creating and using an assessment map to align assessments to learning objectives, employing frequent testing to reinforce learning, and embedding assessments into the training platform.

The following sections describe the prototype technologies and provide an overview of the prototype concept.

Prototype Descriptions

The prototype training technologies developed for this effort were designed to teach Soldiers how to assemble, configure, program and troubleshoot a widely used combat radio, the AN / PRC-148 Joint Enhanced Multiband Inter / Intra Team (JEM) radio. The widespread use of the JEM radio in the Army, as well as other services, made it an appropriate candidate for the prototype training. Currently, training for the JEM radio is conducted in one day at the Signal Regimental Non-Commissioned Officer (NCO) Academy at Fort Gordon, Georgia. During the one-day course, a class of approximately 30 NCOs participates in PowerPoint-based didactic instruction, followed by hands-on practice with the radio. The duration of the instruction and hands-on practice sections typically total six hours (three hours each), but can vary as a result of class size and instructor lecture speed. The following day, students take an open-book test to determine whether or not they pass or fail that section of the course.

In transforming the current JEM training from classroom-based instruction to mobile, virtual, and collaborative training (and the corresponding suite of assessments), the team used an integrated approach. Our concept for the training and assessments was for the training presented in each platform (i.e., mobile, virtual classroom, and virtual collaborative scenario) to build upon one another and for the assessments to track learning within and between modules. Specifically, a CAT was to be used to track learning progress between the mobile and the virtual classroom training. Interim assessments, referred to as check on learning activities were used to measure learning within each platform. A collaborative, capstone-like exercise was used to measure learning and performance at the end of training at both the individual and team levels. All components were coordinated and aligned using an overarching ISD map and a comprehensive technology architecture plan. All portions of the training were integrated into the Soldier-Centered Army Learning Environment (SCALE), a prototype data-driven training architecture and learning management system (Mangold, Beauchat, Long, & Amburn, 2012**)**. Figure 1 provides an overview of the prototype concept.

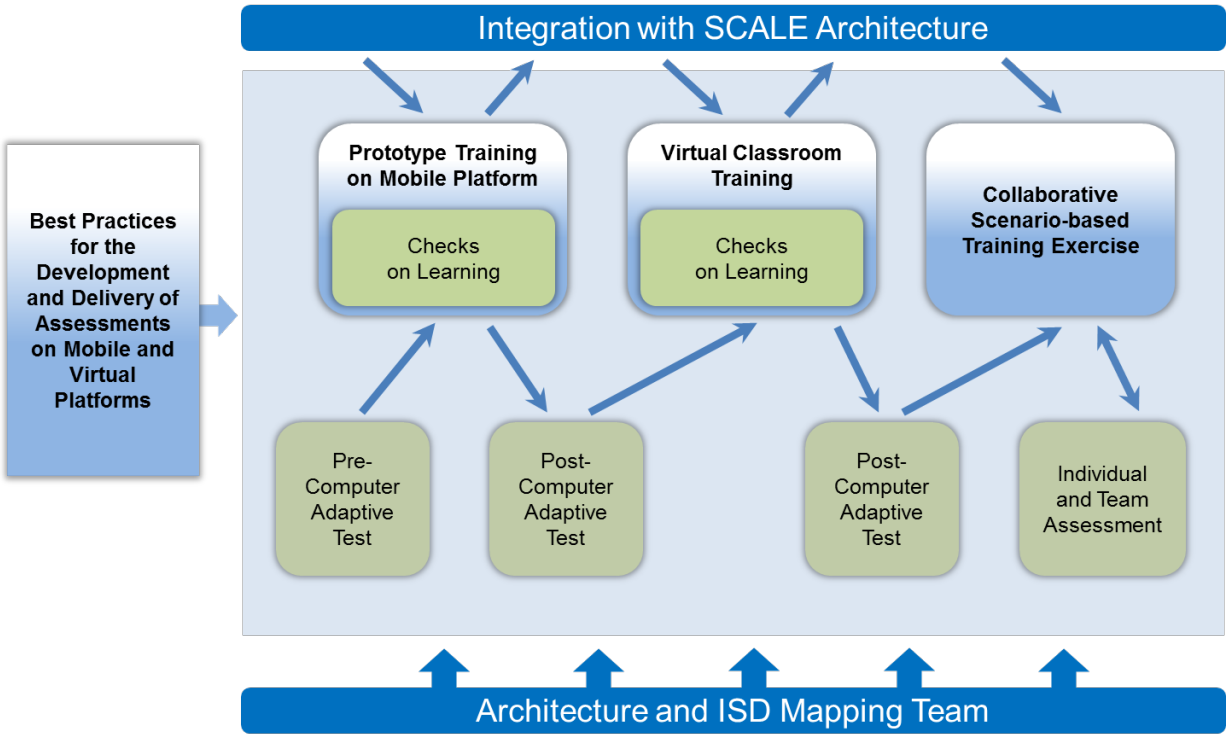


Figure 1: Protoype concept.

Mobile Training Prototype

The mobile application was designed to teach introductory facts and concepts regarding the radio through a combination of didactic learning content and simple hands-on use of a virtual radio. Although the training was designed to run on iOS devices, specifically the iPad, the core content and technologies are portable to other tablet devices, web-based and stand-alone PC and Mac environments. The didactic learning content includes narrated videos, text, images, and animation that review key features and functionality of the JEM radio. The mobile training also contains "try-it" activities that leverage a virtual JEM radio (see Figure 2). Students can manipulate the buttons and knobs on the virtual radio using similar gestures as they would when operating a real radio. A key feature of the mobile training is the integration of assessments (i.e., checks on learning) throughout the training content. These assessments are presented in formats ranging from traditional multiple-choice, true / false, and matching questions, to exercises using a virtual 3D JEM radio. The purpose of the assessments is to reinforce the material covered in training and provide students with feedback regarding their current level of understanding. Students can use this feedback to correct any misconceptions they may have regarding the use and operation of the radio. For example, students receive corrective feedback when they incorrectly respond to a multiple choice, true / false or matching question. After receiving this information, students proceed to the next question (they are not provided an additional opportunity to answer the question). For items that target procedural knowledge, such as exercises that use the virtual JEM radio, students receive step-based corrective feedback.

However, unlike the multiple-choice questions, students are required to demonstrate mastery of the procedure before continuing to the next question.

As shown in Figure 1, pre-and post-tests (using a CAT) bookend the mobile training. The purpose of the CAT is to measure knowledge gains as a result of training. After completing the mobile training, students progress to the virtual classroom training. Progression to the virtual classroom is not contingent on performance on the CAT (although the CAT could be used for this purpose). Assessment scores from the interim knowledge checks and the CAT are recorded and stored in the SCALE architecture, as a means for tracking learning.

Figure 2: Mobile platform screen-shot showing animated sequence to turn the radio on and off.

Virtual Classroom

The virtual classroom is designed to extend core aspects of the mobile training to include the ability to share and deliver content through the use of a "virtual schoolhouse" style interface (see Figure 3). The training material covered in this phase of training addresses more complex skills such as advanced programming and troubleshooting procedures. The virtual classroom application allows the instructor to select and interact with training content that is delivered synchronously to students' workstation. Content includes text and imagery, as well as 3D

content that can be manipulated by the instructor, which enables the instructor to demonstrate how to manipulate the radio. While in the classroom, learners are able to communicate (through text-based chat and voice communication) with their instructors and peers, and request instructor assistance via a "help" button.

Throughout the virtual classroom the instructor is able to present the learners with a set of interactive checks on learning activities that include multiple choice questions, image matching, and interactive radio programming questions. Students also receive corrective feedback during these activities. Upon completion of the virtual classroom instruction (and corresponding assessments), students complete another CAT. Similar to the mobile training experience, student performance on the check on learning activities and CAT is collected and stored in the SCALE architecture. After completing the CAT, students proceed to the collaborative, scenario-based training exercise.

***Figure 3*:** Virtual classroom platform (Instructor View) screen-shot.

Collaborative Scenario

The collaborative application extends features of the mobile application and virtual classroom to include realistic scenario-driven vignettes that require students work in teams to collaboratively resolve issues related to manipulating and troubleshooting the JEM radio (see Figure 4). During the exercise, the control of the radio rotates among team members (teams consist of three players) so that everyone has a chance to manipulate the radio. Like most

collaborative game-based exercises, all players see the same screen. However, only one team member is able to "use' the radio while the other two players watch and offer input. The team member in charge of the radio for the given vignette is designated as the "active learner." During the vignettes, players have the ability to communicate with each other using Voice Over Internet Protocol (VoIP). Team members can use this communication feature for discussion as they proceed through the vignettes and to collaborate about how to complete a task using the radio.

Figure 4: Collaborative scenario screen-shot.

The collaborative scenario includes both group and individual level assessments. Groups are assessed as a whole during the vignettes where the overall score is determined by the number of successful radio actions completed by each team member. Thus team performance is an aggregate score of group performance. In addition, players complete individual knowledge-

based assessments as they progress through the collaborative scenario. These items are scored at the individual level. Individual and team level scores are collected and stored in the SCALE architecture.

Prototype Design and Development

The development of the prototype training and corresponding assessments occurred concurrently and with ongoing coordination between the ISD team and the assessment team. All material produced by one team was iteratively reviewed by the other team, and vice versa. Prototype development is described in the following sections:

- Overall training content design,
- Training environment development, and
- Assessment development.

During the course of this project, the research team visited the Signal NCO Academy at Fort Gordon, GA multiple times to interview instructors, review course materials, observe classes, and collect data to help develop the JEM ISD Map, prototype trainings, and assessments. Because all three training modalities (i.e., mobile, virtual, and collaborative) and the corresponding assessments were created concurrently, these data collection trips typically served multiple purposes. Table 1 briefly summarizes these visits. Throughout this report, we refer back to this exhibit as additional detail is provided about the data collections pertaining to each prototype.

Table 1
Summary of Data Collection Trips

Trip	Date	SMEs / Participants at the Signal NCO Academy at Fort Gordon	Purpose / Activities
1	25-26 January 2012	2 instructors	Preliminary collection of information
2	13-14 March 2012	1 class with 2 instructors and approximately 30 learners	Observation of JEM instructor-led training
3	24-25 April 2012	3 instructors	SME review workshops
4	6-9 August 2012	3 instructors and 8 students (MOS 25U)	Content validation workshops
5	21-24 January 2013	21 learners (MOS 25C and 25U)	Beta test

***Note**. MOS 25C refers to Military Occupational Specialty Radio Operator / Maintainer, 25U refers to Signal Support Systems Specialist.

Overall Training Content Design

The first step in this project was to determine how to best represent the content covered in the classroom-based JEM training. To do this, a systematic, learning-objective driven ISD process was used, based on the ADDIE Model (Analysis, Design, Development, Implementation, and Evaluation) and fully supported by the Systematic Instructional Design model (Dick & Cary, 1990). The process was consistent with the best practices findings and provisional guideline to "apply principles of the learning sciences to carefully plan the integration of learning experiences across training platforms to ensure the effectiveness and efficiency of the training," (Brusso et al., 2014, p. 20).

At the start of the project, the ISD team identified the learning objectives related to the assembly, configuration, programming, and operation of the JEM. The goal was to identify learning needs for the JEM and then decompose behavioral and cognitive-based learning objectives in a systematic manner using terminal (*macro-level*), sub-ordinate (*micro-level*), and enabling learning objectives (*nano-level*) to develop a detailed ISD map (see Figure 5). The decomposition of the systematic learning objectives (terminal, sub-ordinate, and enabling) produced an instructionally sound design.

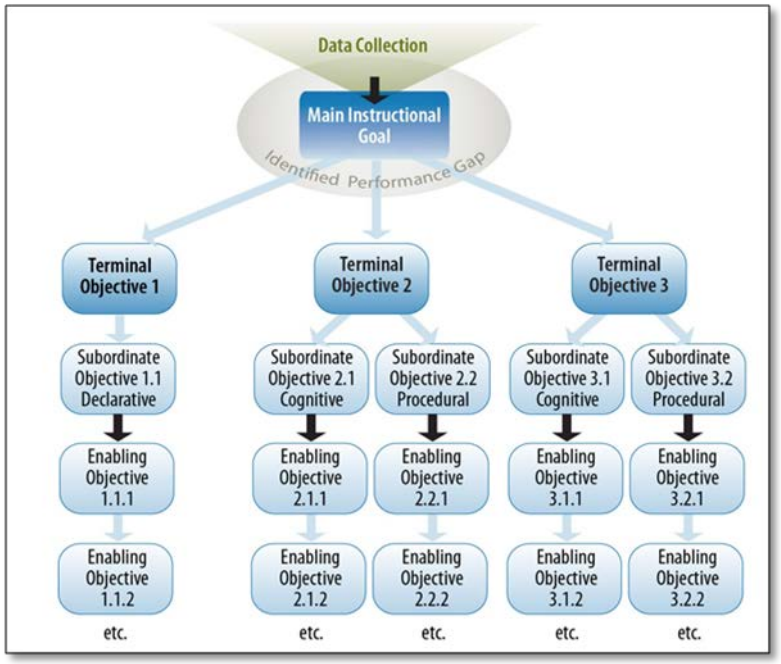


Figure 5: ISD Map schema.

To identify learning objectives and develop this map, use of the radio was observed during data collection trip 1 (see Table 1: *Summary of Data Collection Trips*). The following

background materials provided by the course instructor and SMEs at Fort Gordon were also carefully reviewed:

- Thales Manufacturer's Technical Manual for the AN/PRC-148 (JEM).
- The AN/PRC-148 Instructor Slides used at Fort Gordon for the Signal Regimental NCO Academy's Advanced Leader Course (ALC).

After gathering and analyzing this information, the ISD team developed the first draft of the JEM ISD Map. This map was updated several times over the course of the project, including after observing the classroom-based training (Trip 2) and after meeting with SMEs and Small Group Leaders (SGLs) to review the training storyboards and draft assessment items (Trips 3 and 4).

The final ISD Map contains the entire learning objective decomposition along with associated training modalities (Appendix A). An inspection of the map reveals a natural progression of skills starting with basic content familiarization and evolving to higher-order cognitive skills such as critical thinking and peer evaluation. The ISD map also revealed a categorization of these skills at the terminal objective level (see Figure 6).

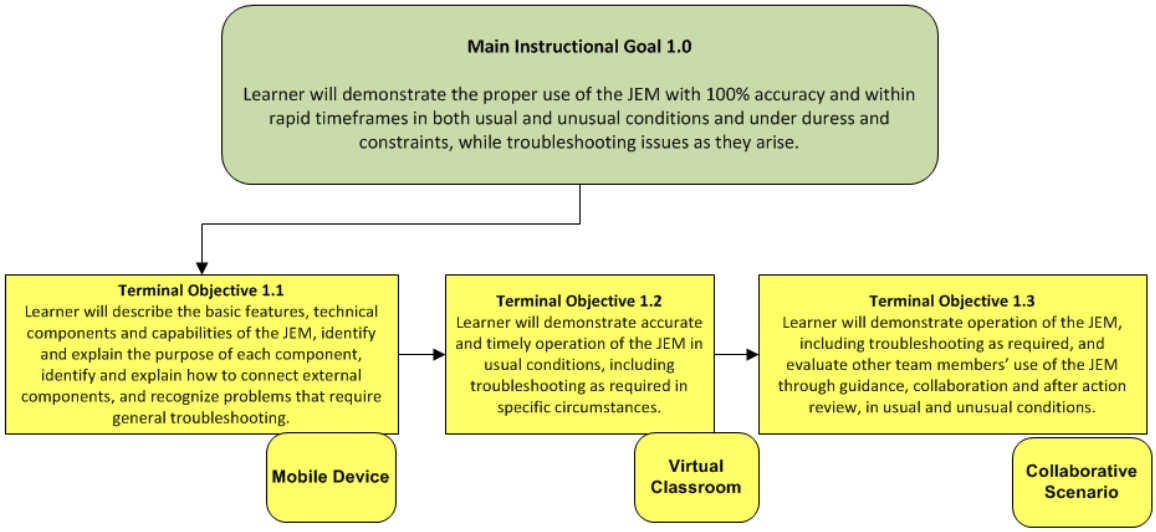


Figure 6: ISD Map for terminal objectives.

The three Terminal Objectives optimally aligned with the three different training delivery methods (i.e., mobile device, virtual classroom, and collaborative scenario exercise) due to the affordances of these training modalities and the characteristics necessitated by the objectives. Bower (2008) discussed the importance of understanding the match between learning objectives and affordances of training delivery methods. For example, temporal affordances (i.e., the ability to access content anytime and anywhere), media affordances (i.e., read-ability, view-ability, listen-ability, watch-ability), and spatial affordances (i.e., move-ability) were a few features that aligned with Terminal Objective 1.1. Alternatively, demonstration was not relevant

to Terminal Objective 1.1. Thus, the enabling objectives under Terminal Objective 1.1 optimally aligned with a Mobile Application, as this delivery method provided the requisite capabilities. Enabling Objectives under Terminal Objective 1.2, conversely, necessitated demonstration. Therefore, Terminal Objective 1.2 more appropriately aligned with a Virtual Classroom delivery method which allowed an instructor to demonstrate the requisite skills in an in-depth manner.

As shown in the ISD Map, each learning objective was associated with an identifier number that allowed the design team to align all aspects of the prototypes to learning objectives including didactic content, scaffolding content (such as hints or guidance), customized real-time performance feedback, and summative feedback. The ISD map also allowed the design team to easily map the assessments to the training components, ensuring that the assessments accurately reflected the training content. This use of an "assessment map" is consistent with the findings from the best practice report (Brusso et al., 2014).

Training Environment Development

The ISD Map allowed the design team to work from a common schema while designing and developing the training and assessment prototypes. It served as a common language for all team members when referring to learning objectives at any level. In developing the prototypes, two questions were particularly important to consider: How do you optimize platform design for each particular training platform? And, how do embed assessments in the respective platforms? The following sections address how we answered these questions by describing the development of the training platforms and embedded assessments.

Mobile environment. The mobile application developed for this effort was designed to meet the learning objectives under Terminal Objective 1.1. Specifically it was designed to teach students how to: identify and describe the basic features, components; and capabilities of the JEM radio; identify and explain how to connect external components to the radio; and recognize problems that require general troubleshooting.

Mobile training content. Content for the mobile application was developed using the following sources:

- JEM Technical Manual,
- JEM classroom presentation slides used for the ALC training at Fort Gordon, and
- Interview and observation data collected during data collection Trips 3 and 4.

The subordinate objectives presented in Table 2 were identified for the mobile application. These objectives translated into four modules.

Table 2

Mobile Application Subordinate Objectives

Subordinate Objective	Description
1.1.1	Learner will define relevant terminology, explain radio safety considerations, and describe features, capabilities, and specifications of the JEM.
1.1.2	Learner will identify the JEM's components (including external components), explain how they are properly assembled and maintained, describe how they are used in the context of the radio's functionality, and state any relevant information such as reminders or troubleshooting.
1.1.3	Learner will explain and demonstrate at a high level how to configure and operate the JEM (including KeyFill) as well as how to access each display screen and explain the significance of each.
1.1.4	Learner will list cues that indicate an issue with the radio and explain how to troubleshoot general issues that can commonly arise.

The ISD Map displays how these four subordinate objectives were decomposed into specific enabling objectives such as "Describe the use of the lamp function and explain when and when not to use it." These enabling objectives were then aligned with specific didactic content, as well as check-on-learning and CAT items (discussed in the *Assessments* section to follow).

As previously noted, content was leveraged from the current training slides and the technical manual. As content was compiled, it was reviewed for accuracy by SMEs during the third and fourth data collections. Revisions were made after each of these data collections based on SME feedback.

Mobile technical platform. The next step in development of the application was to determine which technologies would be used in creating the mobile application. Table 3 provides detailed descriptions of each technology used.

Table 3

Mobile Application Technology Descriptions

Technology	Description
Unity3D	A 3D game and application development environment that leverages the C# ("C-Sharp") language and current open 2D / 3D art asset standards. Used to develop all classroom server and client applications. Unity was identified as the platform of choice due to its ability to deploy applications to multiple platforms using the same code and art assets.
Drasgow Assessment Engine	Leveraged the .NET-developed adaptive assessment engine from Drasgow within Unity3D to present and manage the pre and post adaptive assessments.

***Note**. The hardware intended for the mobile application is the iPad first generation (or greater) with iOS 5.1, touch interface.

Next, storyboards were created to provide the technical team the content and design of the mobile application. Figure 7 is a sample storyboard representing enabling objective 1.1.1.3 (Safety Considerations for the JEM). Storyboards were used to elucidate the necessary elements (e.g., objective number, media required, etc.) and then integrate elements into each page of content for the mobile device.

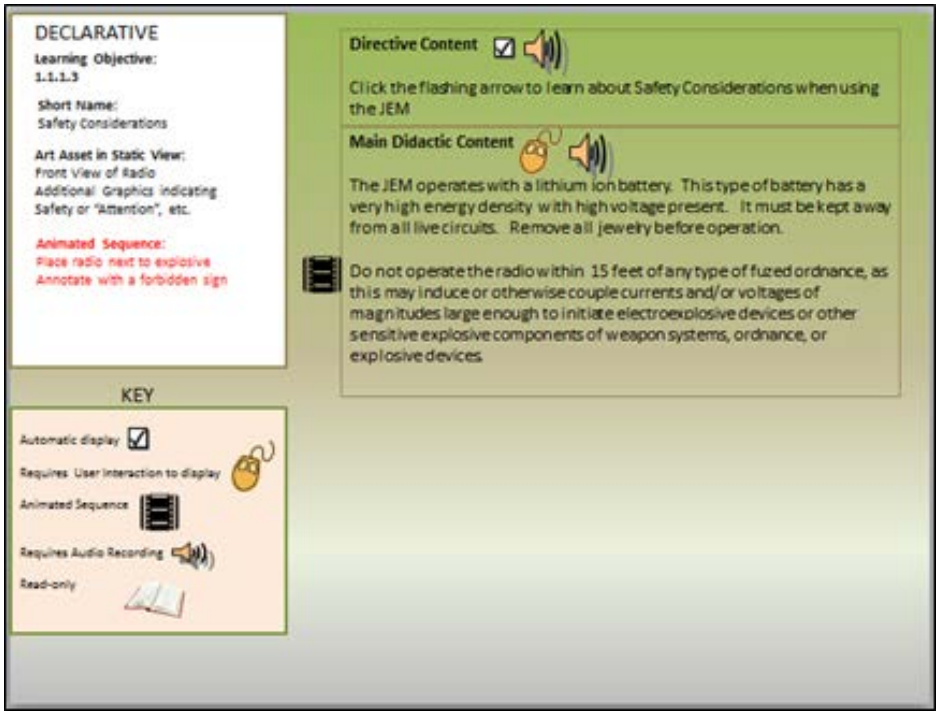


Figure 7: Mobile application storyboard.

Finally, a key component of the mobile training was a fully functional virtual JEM radio (see Figure 8). The virtual radio was developed in parallel across all modalities (i.e., the mobile, virtual classroom, and collaborative scenario). As the functionality requirements surfaced per modality, new functionality was built into virtual simulated radio. The final virtual radio was used in each training modality. This approach provided for efficient development of assets, as well as ensured that the virtual radio functioned consistently across each modality.

Figure 8*:* Screen captures of virtual radio. Full front view is top left, keypad and screen is top right, side view is bottom right, and back view / battery connect is bottom left.

Virtual classroom. The virtual classroom was designed to allow the learner the opportunity to actively demonstrate how to assemble / disassemble, configure, program, operate, and troubleshoot the JEM radio.

Virtual classroom training content. The ISD Map contains a detailed breakdown of virtual classroom objectives (Terminal Objective 1.2). Content for the learning objectives in Terminal Objective 1.2 was developed using the following sources:

- JEM Technical Manual,
- JEM classroom presentation slides used for the ALC training at Fort Gordon, and
- SME interview data collected during data collection Trips 2, 3, and 4.

Table 4 contains a listing of the subordinate objectives contained in the virtual classroom platform.

Table 4
Virtual Classroom Subordinate Objectives

Subordinate Objective	Description
1.2.1	Learner will demonstrate the JEM's Start Up procedures, while trouble-shooting as required, and will engage in peer-to-peer instruction as appropriate.
1.2.2	Learner will demonstrate how to program the JEM's Global Parameters, while trouble-shooting as required, and will engage in peer-to-peer instruction as appropriate.
1.2.3	Learner will demonstrate the JEM's Key Management procedures, while trouble-shooting as required, and will engage in peer-to-peer instruction as appropriate.
1.2.4	Learner will demonstrate how to program channels on the JEM, while trouble-shooting as required, and will engage in peer-to-peer instruction as appropriate.
1.2.5	Learner will demonstrate how to set up Group Programming, while trouble-shooting as required, and will engage in peer-to-peer instruction as appropriate.
*1.2.7	Learner will demonstrate how to zeroize the JEM and provide a context for a complete zeroize versus a channel zeroize and will engage in peer-to-peer interaction as appropriate.
1.2.8	Learner will demonstrate how to clone JEM's programming, while trouble-shooting as required, and will engage in peer-to-peer interaction as appropriate.
*1.2.10	Learner will demonstrate establishing communications with configured radio using the PTT with another peer, several peers, and / or with the virtual instructor.

***Note.** 1.2.6, 1.2.9 remain in the ISD map, but were not included in the training content as they were determined to be out of scope by ARI and the SMEs after reviewing the results of the beta-test.

The JEM ISD Map displays how the eight subordinate objectives were decomposed into specific enabling objectives such as "Identify and inventory the standard JEM accessories." Objectives were then aligned with specific didactic content. These objectives were also aligned with checks on learning and CAT items (discussed in the *Assessments* section to follow).

As with the mobile training, content was leveraged from the current training slides and the technical manual. SMEs reviewed the accuracy the content during the second, third, and forth data collection trips; revisions were made after each trip.

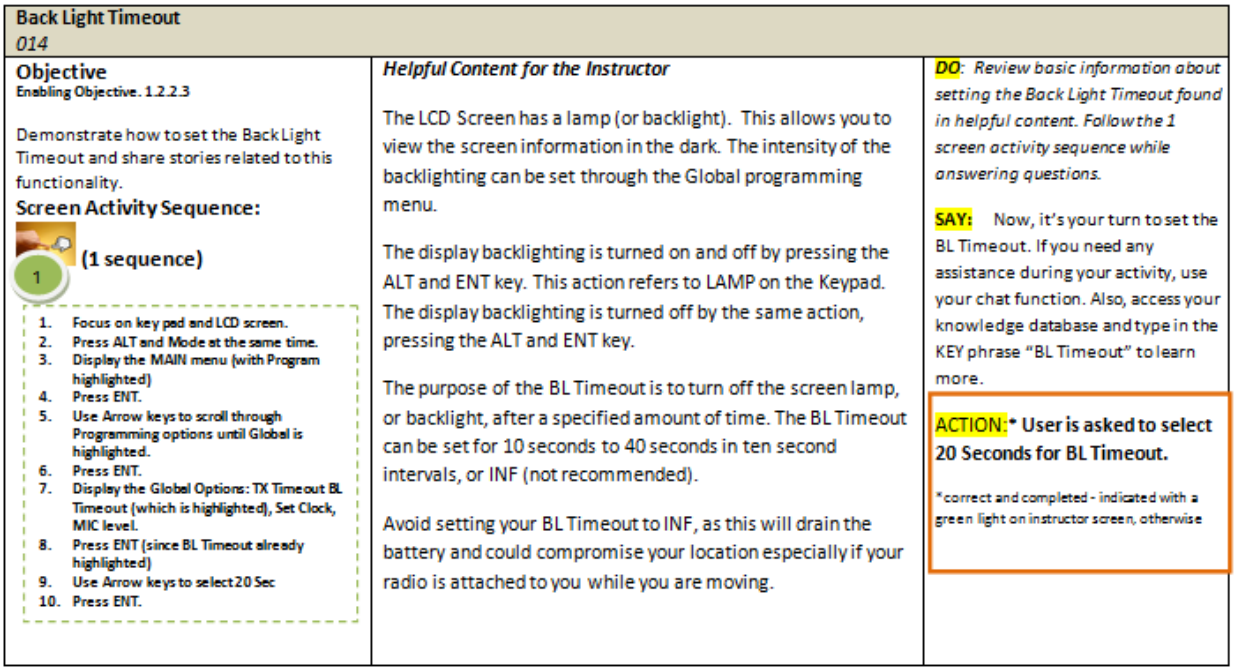
Virtual classroom technical platform. The virtual classroom employed the following software technologies: Unity Master Server, Unity Multiplayer Networking Application Programming Interface (API), TeamSpeak VIOP Software Development Kit (SDK), and Unity3D. The descriptions of each software technology are provided below in Table 5.

Table 5
Virtual Classroom Software Technology Descriptions

Technology	Description
Unity Master Server	Provided a classroom coordination service. When a classroom server is started, the service registers with the master server with details about the location and type of server that has been made available. When the instructor client or learner client is started, it reaches out to the master server to obtain a list of relevant classroom servers available.
Unity Multiplayer Networking API	Provided a technology layer that manages network messaging and synchronization services. Chosen for its built-in networking application programming interface (API) because of the tight integration with the Unity development environment.
TeamSpeak VIOP SDK	Provided integrated voice communications. The voice communications system includes a standalone voice server application, and a software integration layer built into the virtual classroom clients.
Unity3D	A 3D game and application development environment that leverages the C# (C-Sharp) language and current open 2D / 3D art asset standards. Used to develop all classroom server and client applications. Unity was identified as the platform of choice due to its ability to deploy applications to multiple platforms using the same code and art assets.

As mentioned previously, the virtual radio was developed in parallel across all modalities; new functionality was built into it based on requirements of the virtual classroom. A script was created to provide the technical team the content and design of the virtual classroom. The script included details about learner interaction and screen activity sequences. This approach was similar to the storyboard approach used for the mobile platform; however, the

mobile storyboards only contained learning and media content, whereas the virtual classroom scripts contained screen activity sequencing and instructor dialogue content. Figure 9 presents a sample script for enabling objective 1.2.2.3 (Demonstrating how to set the Back Light Timeout).



Back Light Timeout
014

Objective
Enabling Objective. 1.2.2.3

Demonstrate how to set the Back Light Timeout and share stories related to this functionality.

Screen Activity Sequence:

(1 sequence)

1. Focus on key pad and LCD screen.
2. Press ALT and Mode at the same time.
3. Display the MAIN menu (with Program highlighted)
4. Press ENT.
5. Use Arrow keys to scroll through Programming options until Global is highlighted.
6. Press ENT.
7. Display the Global Options: TX Timeout BL Timeout (which is highlighted), Set Clock, MIC level.
8. Press ENT (since BL Timeout already highlighted)
9. Use Arrow keys to select 20 Sec
10. Press ENT.

Helpful Content for the Instructor

The LCD Screen has a lamp (or backlight). This allows you to view the screen information in the dark. The intensity of the backlighting can be set through the Global programming menu.

The display backlighting is turned on and off by pressing the ALT and ENT key. This action refers to LAMP on the Keypad. The display backlighting is turned off by the same action, pressing the ALT and ENT key.

The purpose of the BL Timeout is to turn off the screen lamp, or backlight, after a specified amount of time. The BL Timeout can be set for 10 seconds to 40 seconds in ten second intervals, or INF (not recommended).

Avoid setting your BL Timeout to INF, as this will drain the battery and could compromise your location especially if your radio is attached to you while you are moving.

***DO**: Review basic information about setting the Back Light Timeout found in helpful content. Follow the 1 screen activity sequence while answering questions.*

SAY: Now, it's your turn to set the BL Timeout. If you need any assistance during your activity, use your chat function. Also, access your knowledge database and type in the KEY phrase "BL Timeout" to learn more.

ACTION:* **User is asked to select 20 Seconds for BL Timeout.**

*correct and completed - indicated with a green light on instructor screen, otherwise

Figure 9: Virtual classroom script.

Collaborative scenario. The objective of the collaborative scenario was slightly different from that of the mobile application and the virtual classroom. Specifically, the purpose of the collaborative scenario was to assess students' ability to use and manipulate the radio. Therefore new material was not presented. Therefore, the entire scenario essentially functioned as an assessment. Below is an overview of the development process, which included:

- Developing the collaborative scenario concept,
- Identifying subordinate objectives,
- Collecting critical incidents,
- Creating vignettes, and
- Developing a collaborative scenario technical platform.

A description of the scoring approach is provided in greater detail later in the report; specifically in the section that describes the methodology for creating the assessments.

Collaborative scenario concept. Because use of the JEM radio use is not an inherently team task, it was necessary to create an underlying concept for the collaborative scenario before developing any content. The first step in developing the collaborative scenario was to determine an overarching concept or framework delineating the nature of the exercise and the pattern of player interaction (i.e., how they would collaborate). After consulting SMEs and SGLs about use of the radio in operational settings, the current scenario-based concept was developed. The concept involved three players working together to complete a series of tasks using the radio as they progressed through a virtual "day in the life" of a signal support systems specialist.

There were several advantages to this design concept. First, the "day in the life" approach offered an opportunity for learners to apply what they had learned during the mobile and virtual classroom trainings, preparing them for knowledge and skill transfer in the real world. This type of scenario also added a decision-making dimension (i.e., "when to do") in addition to the knowledge and skill dimension (i.e., "how to do"). This dimension made it an ideal approach for evaluating performance on tasks that required critical thinking and decision-making. Second, the training technology could be leveraged to provide a simulated operational, high-fidelity, contextualized training environment that is more engaging than lecture based methods; a characteristic that is likely to lead to more effective training and transfer (Noe, Tews, & McConnell Dachner, 2010). Third, the setup of the scenario provided both structural and emergent components of collaboration. The structural component (i.e., the radio being passed from one player to the next) ensured collaboration because all players needed to succeed in their scenarios for the team to accomplish the overall goal. The emergent component (i.e., how the players will work together over the open communication channel) reflected natural collective performance processes.

Subordinate objectives. The collaborative scenario was designed to allow the learner to demonstrate operation and troubleshooting of the JEM as required, and to evaluate other team members' use of the JEM through guidance, collaboration, and after action review (AAR). Content for the collaborative scenario was developed using the following sources:

- JEM Technical Manual,
- JEM classroom presentation slides used in the ALC at Fort Gordon, and
- SME interview data collected during data collection Trips 2, 3, and 4.

Table 6 contains a listing of the subordinate objectives identified for the collaborative scenario.

Table 6
Virtual Classroom Platform Subordinate Objectives

Subordinate Objective	Description
1.3.1	Identify unusual conditions and estimate the impact these conditions will have on the proper use of the radio and formulate how to accommodate the unusual condition.
1.3.2	Configure and manipulate the JEM properly and maintain communications in a scenario of usual conditions while troubleshooting as required.
1.3.3	Execute guided practice and provide feedback to reach a successful conclusion of established communications, given a scenario of usual conditions.
1.3.4	Configure and manipulate the JEM properly and maintain communications in a scenario of unusual conditions while troubleshooting and adapting as required.
1.3.5	Execute guided practice and provide feedback to reach a successful conclusion of established communications, given a scenario of unusual conditions.

The ISD Map shows how these five subordinate objectives were decomposed into specific enabling objectives such as "Describe the circumstances of an ordinance-ridden area and what impact this could have on radio use." The objectives were then leveraged for content development in the collaborative scenario along with information collected from critical incidents.

Critical incidents. Critical incidents are examples of actual behavior that illustrate outstanding or unacceptable levels of job performance (Brannick, Levine, & Morgeson, 2007). The purpose of collecting critical incidents for this effort was to provide context for the learning objectives identified so that the scenario could be as real as possible. Once the concept for the collaborative scenario was determined, SMEs were interviewed at Fort Gordon to collect critical incidents. During these meetings two SMEs described detailed scenarios that involved using the JEM radio in an operational context. The questioning technique used also allowed the team to establish requirements for appropriate art assets, virtual environment components, player actions, and non-player character (NPC) actions. Based on the information collected, 10 initial vignettes were confirmed within one scenario story of a Personnel Security Detachment (PSD) mission where a Colonel visits a local village to check on the progress of a new school under construction. Various tasks related to the use of the radio were required of Soldiers accompanying the Colonel.

Vignettes. Building on the critical incidents collected, detailed vignettes for the collaborative scenario were developed. Several key considerations guided the development process. First, the design team ensured the situation players encountered would not result in repeated task execution; the tasks required in the vignettes were designed to be mostly

independent to avoid over-penalizing the same mistake (e.g., performance on one task would not affect performance on another task). Second, the subordinate objectives from the ISD Map were referred to in order to ensure that a variety of tasks were covered throughout the vignettes. Finally, the vignettes were written so that the assessments strictly adhered to the learning objectives and training content covered in the ISD map; they did not involve any tactical decision-making or extraneous criterion elements.

At the end of the development process, seven fully developed vignettes were derived (see Appendix B). These vignettes were developed using a storyboard method that documented each vignette with all of its components in order of appearance. For each vignette, trainees are first presented with a video clip that provides each player with an overview of the task and setting for the radio. After viewing the video, trainees are prompted to answer one or two individual-level knowledge check questions (see *Assessments* section to follow). The content of the vignettes was validated by SMEs and SGLs at Fort Gordon. Specifically, SMEs provided the development team with feedback with regard to the content and face validity of each vignette. This information was used to revise each vignette in the collaborative scenario.

Collaborative scenario technical platform. The vignette screenplays served as a functional specification in the development of the animated sequences and assessments for the collaborative scenario. The technologies used to create the Virtual Classroom (Unity Master Server, Unity Multiplayer Networking API, TeamSpeak VIOP SDK, and Unity3D) and the virtual radio, were also employed in the collaborative scenario.

Assessment Development

Concurrent with the training technology development, an assessment team, consisting of research psychologists created a suite of training assessments that included: a CAT; interim assessments for the mobile training and the virtual classroom; and individual and group level assessments for the collaborative scenario. The provisional guidelines outlined in Brusso et al. (2013) were used to direct the development of the prototype assessments. For example, assessments were embedded within each training platform to maximize training efficiency; and frequent testing was employed throughout the training prototypes as a means of reinforcing learning. The follow sections contain a description of how each assessment type was developed.

Assessment data, along with student profiles, were stored in a prototype implementation of the SCALE architecture (Mangold et al., 2012). This solution provided a web-based interface that allowed administrators to create and authenticate student accounts for each of the training modalities (mobile, virtual classroom, and collaborative scenario). The SCALE architecture also provided a means to record and store interaction data from each modality. The prototype was built as an extension of a Drupal content management system that leverages PHP (Hypertext Preprocessor) code and uses a MySQL (My Structured Query Language) database to provide persistent storage of interaction and assessment data.

Computer adaptive testing. To complement the mobile device training and the virtual classroom modules, and to measure learning between training modalities, the assessment team developed a CAT; it was specifically designed to serve as the pre- and post-test at the beginning

and conclusion of the mobile training, as well as after the virtual classroom training. The assessment team employed item response theory (IRT) and adaptive testing principles as the base psychometric technology for the CAT. IRT does not assume that every item is equal with regard to assessing student ability. Rather, it assumes that measurement can become more precise by accounting for several item characteristics and their relationship with the trait being measured. With dichotomously scored multiple choice items, up to three IRT parameters can be used in adaptive testing: item difficulty, item discrimination, and a "guessing" parameter. In the one-parameter logistic model (1PLM; Rasch, 1960) item difficulty is the only item property used to identify the best items to present to an examinee for ability and standard error estimation. In the two-parameter logistic model (2PLM; Birnbaum, 1968) item discrimination is also considered. The discrimination parameter reflects an item's measurement sensitivity at different ability levels. The three-parameter logistic model (3PLM; Birnbaum, 1968) includes an additional parameter, which relates to the likelihood of a low-ability examinee getting an item correct due to chance factors such as guessing.

Depending on the IRT model desired, different sample sizes are required for parameter estimation. The 3PLM typically provides good fit to data for knowledge and skills based assessments, but it requires a large sample size (1000 or more). As such, many CAT programs initially use simpler alternatives, such as the 2PLM or the 1PLM (Hambleton, Swaminathan, & Rogers, 1991). With the 1PLM, samples of 150 for item parameter estimation are not uncommon.

For this effort, the CAT was based on the 1PLM. Because there were no pre-existing data on the difficulty of the test items, appropriately scaled SME ratings of item difficulty were used in place of actual IRT item difficulty parameter estimates (see section on item validation). This method has been used previously by researchers in developing CAT. For instance, Stark, Chernyshenko, and Guenole (2011), found that SME-based item difficulty ratings were strongly correlated with true proficiency scores (+.90), even when the SME ratings correlated only moderately (.60) with actual IRT difficulty parameters. This finding, coupled with the developmental purpose of this current training assessment prototype, suggests SME difficulty ratings were a viable and useful means for estimating item difficulty, at least until sufficient empirical data have been collected to calculate the more traditional maximum likelihood IRT parameter estimation.

One advantage of CAT is that scoring does not require trainees to receive the same sequence of items; instead a subset of items is chosen from an item pool based on estimated ability level. Consequently, trainees can take an assessment more than once without seeing the same exact items, which helps reduce recency effects and maintains a sufficient level of challenge. In addition, CAT maximizes testing time by identifying the most diagnostic items for each trainee, and administering these items based on an estimate of learner ability. Research has shown that adaptive testing can reduce test length by approximately 50% without losses in measurement precision (Weiss & Kingsbury, 1984). The detailed development procedures for the CAT are presented in the following subsections.

The assessment team used a series of steps to design the CAT. This process included developing a test plan based on the ISD Map, drafting test items, reviewing and revising test

items, and collecting SME ratings of the items. Revisions were incorporated iteratively throughout the process to ensure the items accurately measured the knowledge mapped in the training content.

Test plan. The CAT item pool was designed to vary sufficiently in difficulty to accurately assess individuals across all proficiency levels in every content domain relevant to the JEM radio training. To achieve this goal, the assessment team first reviewed the ISD Map and, based on the subordinate learning objectives, synthesized the content into four main subject domains: Functionality / Basic Procedures, Complex Procedures, Terminology and Specifications, and Troubleshooting. Next a test plan for each domain, based on the enabling objectives in the ISD Map, was created to guide the item development process. For each content domain, the test plan included a guide on how to develop items that varied in difficulty level (easy, medium, and difficult). The proposed difficulty stratification in the test plan was intended to provide a roadmap for item writers to ensure sufficient variance in difficulty of the draft items. Once draft items were developed, the actual item difficulty parameters were estimated empirically using SME ratings on a seven-point Likert scale (see section on item validation).

Test items. To begin the item-writing process, the assessment team first became familiar with the JEM radio training content. Each team member attended a training session during which members were provided a set of uniform guidelines, including the test plan, to ensure consistency in the quality of items drafted. Examples of items at various difficulty levels were provided to assist them with the item development process. Then each item writer was assigned a portion of the test plan for which to develop items. The majority of the item-writing assignments were distributed among three key item writers with two additional item writers serving as reviewers and writing additional items as needed. A Microsoft Access database was constructed to store and organize all the draft items. For each item entered, the associated content domain, enabling objective and projected item difficulty were documented.

Throughout the item development process, the assessment team convened regularly to report progress and discuss any issues encountered. Once all draft items were created, an internal review process was conducted to examine the language, clarity, and relevance of the items. As part of this internal review, all items were examined by internal SMEs for accuracy and relevance. Items that were ambiguous or inaccurate were revised accordingly.

Item Validation. Next, the draft item bank was presented to SMEs at Fort Gordon for feedback as part of the item content validation process. During this workshop, SMEs were asked to scrutinize each draft item and provide edits when necessary. At the beginning of the workshop, the SMEs received a brief introduction on the purpose of the validation process. They also received a list of questions to consider during the review, such as:

- Is the item stem written clearly (i.e., is the question being asked easily understood)?
- Is the terminology pertaining to the JEM radio used correctly in the item?
- Is there only one correct answer to the question?
- Are the incorrect response options effective?
- Is there a better answer to the question that is not one of the response options?

- Is the intended difficulty level for the item appropriate?

In addition, SMEs were asked to review all the items vis-à-vis the ISD Map to: (a) determine whether the item pool adequately covered all content domains in the training, and (b) identify any potential gaps or missing areas where new items needed to be added. Finally, as part of the validation process, SMEs were asked to estimate the level of difficulty for each item. Specifically, they were asked to provide ratings on the relative level of difficulty of each item on a seven-point Likert scale, from very low to very high. The scale's answers were as follows: 1 = very low; 2 = moderately low; 3 = slightly low; 4 = average; 5 = slightly high; 6 = moderately high; and 7 = very high. SMEs first independently reviewed the items to provide individual edits and ratings. Once they finished the independent review, they were debriefed, and given an opportunity to discuss their feedback in more detail.

Upon conclusion of the fourth data collection, all SME feedback was reviewed and incorporated, and items deemed unclear or irrelevant were either revised or dropped. A fully developed and validated pool of multiple choice items was then completed and loaded into the CAT technical platform for implementation in the training.

CAT technical platform. The current CAT technical platform is configured to support computer adaptive assessments before and after the mobile and virtual classroom training modules. Each assessment consists of 12 items drawn from a 183-item pool covering the four relevant content areas (i.e., Functionality / Basic Procedures, Complex Procedures, Terminology and Specifications, and Troubleshooting); the number of items administered for each content area is currently set to three. The CAT includes text, graphic, and audio-based multiple-choice items. Examples of audio and graphic-based items are shown in Figures 10 and 11.

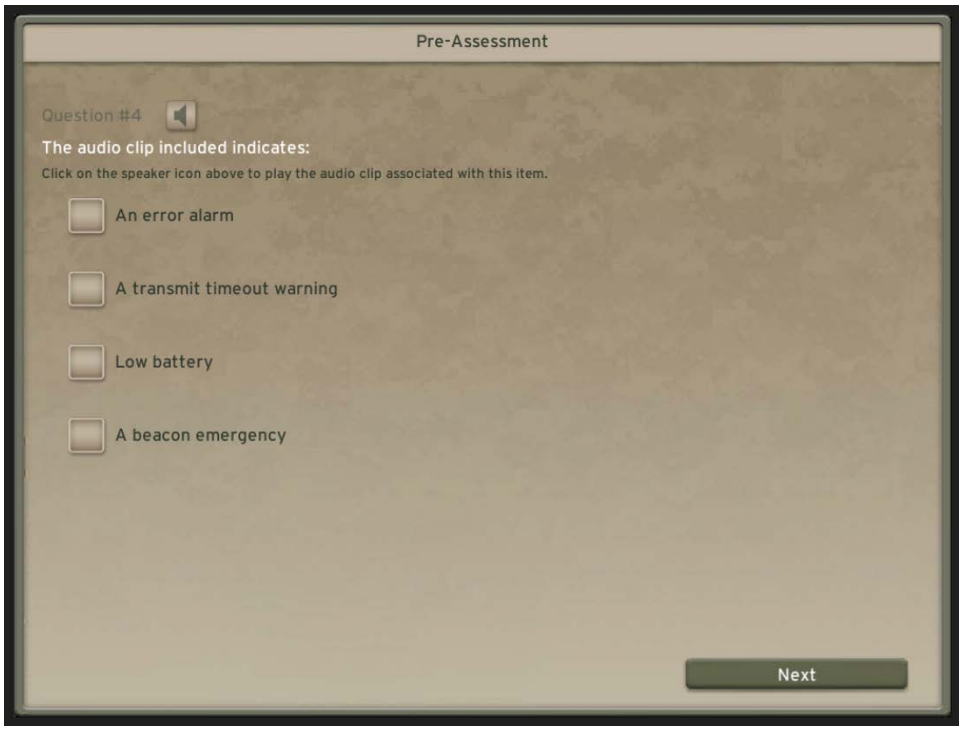


Figure 10: Audio-based CAT item.

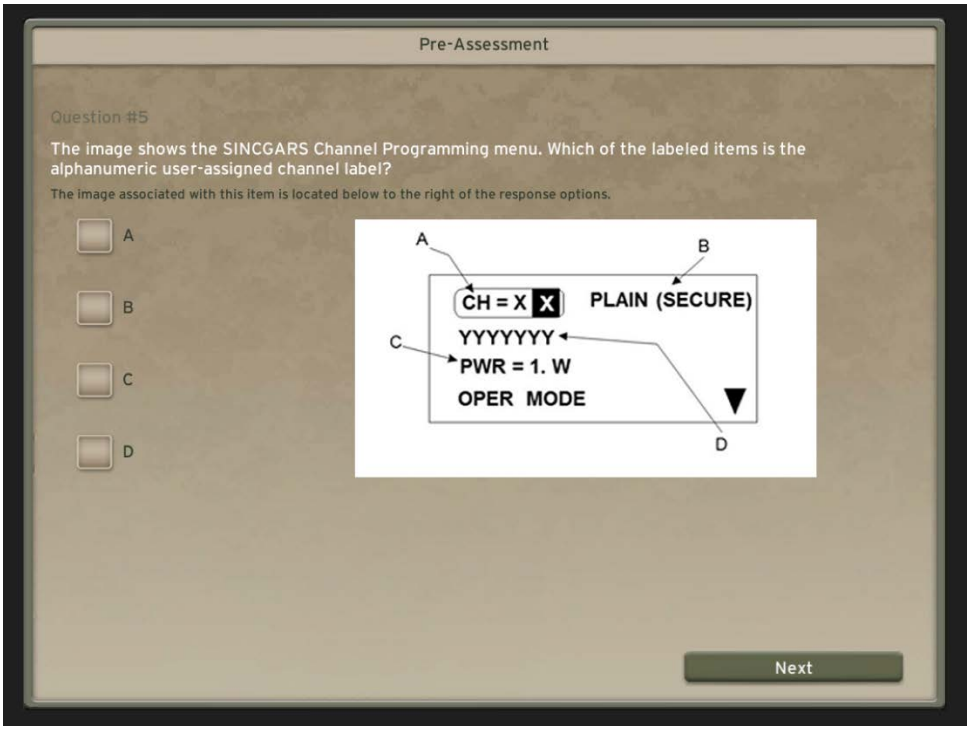


Figure 11*:* Graphic-based CAT item.

The current set of three assessments proceeds as follows. At the beginning of the first assessment, the testing platform loads assessment specifications consisting of the total number of items to be administered, the number of items per content area, and the available item pool. Next, a content blueprint is created by randomly ordering the desired content areas for test administration. Specifically, if three items per four content areas are specified, the testing platform will create a 12-item test where the four content areas appear three times each in a random order.

Next, an examinee is assigned a provisional assessment score of zero (0.0) and the test begins by selecting the first item from a pre-specified content area. Item selection is adaptive throughout the whole assessment. It calculates information values (i.e., IRT statistics for measurement precision) at each examinee's current score for all available items in that content area (based on the one parameter logistic IRT model). After an examinee answers the first item, his or her score is calculated via IRT expected a posteriori (EAP) estimation and the next item is chosen to satisfy both content and information requirements. The assessment continues until all 12 items have been administered. Then, the properties of administered items, examinee answer choices, scored item responses, and the examinee's final test score are recorded in a database. Subsequent assessments proceed in the same manner, except that data from previous tests are used to prevent repetition of items. To improve efficiency, rather than starting each test with an initial trait score of 0.0, the final score on the most recent assessment is used. This essentially allows the examinee to "pick up" where he or she left off.

The adaptive testing platform can be configured to accommodate different numbers of assessments, content areas within each assessment, numbers of items in the pool representing each content domain, and different test lengths. A test designer can also modify rules for item repetition and choose alternative starting values for the assessments.

Checks on learning. In line with the provisional guidelines from Brusso et al. (2014) to employ frequent testing to reinforce learning, periodic assessments were presented to Soldiers during the mobile and virtual classroom training environments. These assessments were called "checks on learning" to reflect terminology currently used in the classroom. Creation and implementation of the checks on learning items within each platform is discussed next.

Mobile checks on learning. A bank of interim assessment items was created for each subordinate objective in the mobile training. The items were grouped into nine chunks and administered at roughly equal intervals throughout the training. Each chunk only focused on content covered in the training that immediately preceded it (since the last check on learning assessment). Learners are prevented from returning to previous training content while engaged in a check on learning assessment, but are able to revisit material after completing it. The check on learning assessments served multiple purposes. They assessed trainees understanding of the previously presented training material, allowed trainees to practice applying the knowledge and principles, and provided trainees with feedback. This feedback was especially relevant in the mobile training because it was designed to be completed individually, without the guidance of a live instructor.

The first step in drafting the interim assessment items was to develop eight different item formats. The different formats required trainees to practice applying their knowledge in varied and unique ways and utilized the available. Table 7 lists and describes each item format.

The assessment team then developed items for each subordinate objective (roughly, one item per enabling objective). Items were developed to utilize all of the different formats although some were used more than others (depending on which formats were seen as the best fit to assess the training content). Each item includes response options that could be selected using the tablets interactive touch-screen interface. To submit an answer, learners click the "Submit" button after responding to an item. After clicking submit, learners receives both immediate corrective text-based feedback on their response (whether it was correct / incorrect, with a brief explanation of the correct answer) and auditory feedback (a "ding" with a green check to indicate correct or a buzz with a red "X" to indicate incorrect). If a learner submits an incorrect response to an item in the virtual JEM programming format, the process to continue to the next item is slightly different. After submitting an incorrect response to a virtual JEM programming item, the learner cannot continue to the next item until the action required is performed correctly. The feedback presented to the learner provides step-by-step guidance regarding the correct procedural action. After following these steps, the learner must again click submit. The item is still scored as incorrect; however, this procedure aids in learning by having the learner master the procedure before moving forward.

After drafting a complete set of items for each subordinate objective, these items were reviewed by SMEs during the fourth data collection trip. SMEs provided input on the accuracy

of the content in each item, as well as the accuracy of the correct answer and response option distracters. In some cases, items were discarded and re-written with the assistance of the SMEs. Following the fourth trip, the items were finalized by the assessment team. The check on learning activities were designed to require students to answer each question before proceeding to the next item or before advancing to the next lesson. A timer was added to each item, such that if the learner remained on one item for more than five minutes, time expired, and the learner is forced to move on to the next item. The five minute time limit was chosen because it is not expected to impact the ability of even the slowest test taker to complete the item correctly (given their content, format, and difficulty). However, if reached, the imposed time limit will move the candidate forward so that the check on learning assessment can come to a conclusion within a reasonable amount of time.

The mobile training item blueprint, including a summary of the items by check on learning assessment and subordinate objective is provided in Table 8.

Most items are worth one point each; however, several items include multiple parts and are therefore worth multiple points. Following each check on learning activity, the learner can review a summary of which items they answered correctly and incorrectly.

Table 7

Check on Learning Item Formats and Descriptions

Item Format	Description	Example
True or False	Learner clicks on 'True' or 'False' in response to the item.	Indicate whether the following statement is true or false. Initial synchronization is necessary for all encrypted operations. a. True b. False
Matching	Two or more items are presented together with multiple response options. Each item has only one correct answer. When an option is dragged, it should disappear from the option list.	Drag the definition on the right to the associated term on the left. 1. COMSEC 2. TRANSEC a. Measures taken to deny unauthorized persons information derived from telecommunications. b. Measures taken to protect transmissions from the interception and exploitation by means other than crypto-analysis (for example, "jamming").
Choose all that apply - Matching	Two or more items are presented together. Response options are displayed underneath. Learner can drag option(s) up to applicable item. When an option is dragged, the option remains below so it could be used again for the other item. Some items include images.	Match the word on the right with where it belongs in the acronym on the left. 1. Multiband Inter/Intra T____ Radio 2. Joint T____ Radio System a. Team b. Technical c. Tactical d. Telecommunications
Multiple Choice	Learner selects the one best response from a list of options. Some items include pictures in the item stem or response options.	Choose the best answer. Which of the following is NOT a characteristic of SINCGARS? a. Single channel b. Frequency hopping c. VHF d. UHF

Table 7 (continued)

Check on Learning Item Formats and Descriptions

Choose all that apply - Multiple Choice	Formatted like a multiple-choice item, except the learner can select as many options as desired. Some items include images.	Choose all that apply. A Soldier needs to transfer the programming of one JEM to another. He has successfully connected the JEMs with the cloning cable. Which of the following can he expect to be transferred during cloning? a. COMSEC keys b. Global settings c. Channel settings d. SINCGARS loadsets e. SINCGARS NET TIME f. Group settings e. Real time clock time
Interactive Multiple Choice	Item includes a bar with arrows or a movable icon that the learner can slide to indicate the answer.	Indicate your answer on the ruler. What is the BASIC frequency range of the JEM? Drag the arrows to indicate the minimum and maximum frequencies. [Ruler marked with: 0, 30, 60, 128, 256, 512, 724 MHz]
Virtual JEM - Without programming	Items include a virtual JEM. Items require the learner to click on the JEM to identify specified components, to drag labels to the appropriate location on the JEM, or to connect external components to the JEM. Items do not require use of the keypad for programming.	[Show virtual JEM] Drag the name of the control to its location on the JEM. a. On / Off switch b. Channel select switch c. Internal speaker microphone d. Keypad e. Mechanical interlock
Virtual JEM - With programming	Items include a virtual JEM that the learner must program using the keypad.	Use the keypad to complete each of the following actions. After you complete each action, click submit, and you will be prompted to perform the next action. 1. Change the selected group to Group 4 (G04). 2. Open the channel scan screen. 3. Turn the lamp on.

Table 8

Mobile Training Check on Learning Item Blueprint

Check on Learning Assessment	Subordinate Objective	Number of Items
1	1.1.1	4
2	1.1.1	6
3	1.1.1	8
4	1.1.2(AB)	7
5	1.1.2(AB)	2
	1.1.2(C)	7
6	1.1.2(C)	8
7	1.1.3	11
8	1.1.3	6
9	1.1.4(A)	7
	1.1.4(B)	1
	1.1.4(C)	2
	Total Number of Items	69

Virtual classroom checks on learning. Virtual classroom checks on learning were developed in a similar fashion to those developed for the mobile training. The assessments used a number of item formats that required students to apply the material covered in the previous modules through interactive activities.

Several differences between the virtual classroom and mobile training checks on learning are worth noting. First, the virtual classroom items required the use of a mouse instead of a touchscreen interface. This requirement did not impact developing the item content, although it may impact the learner experience when completing items in the virtual classroom versus the mobile training.

Another difference was the varying goals of Terminal Objectives for the mobile training and virtual classroom training. Whereas the mobile training had a stronger focus on declarative knowledge, the virtual classroom had a greater focus on demonstrating that knowledge. Therefore, the virtual classroom included a greater ratio of virtual JEM programming items. As previously stated, the alignment of objectives, and subsequently training content, and delivery method are a result of the match between the content and the affordances of the training technology (see Bower, 2008). Thus, the training in the mobile environment was more heavily focused on declarative knowledge, whereas the virtual classroom focused on building on this declarative knowledge. This progression aligns with theoretical models of learning or training progression (e.g., Anderson's ACT* theory; see Anderson 1987, 1996). As discussed by Goldstein and Ford (2002), these stages specify declarative knowledge (i.e., factual knowledge) as the necessary first step in the learning process. Following the retention of declarative knowledge, trainees engage in a knowledge compilation stage, a transitional stage where learners begin to progress from possessing declarative knowledge, or the "what", to eventually possessing procedural knowledge, the "how" and "when." Anderson's ACT theory specifies that the effective knowledge of procedures only occurs after a trainee possesses the requisite declarative knowledge (Anderson, 1996).

A third difference was the item completion time limit. All items in the mobile training included a 5 minute limit, whereas some in the virtual classroom were given a 10 minute limit because they were slightly more in-depth, particularly the virtual JEM programming items.

Finally, the following options were only available in the virtual classroom: the instructor can review how learners are performing on the assessments, and choose to review material if it seems several learners are not acquiring the necessary knowledge and skills. After a check on learning assessment is complete, learners can also utilize the chat feature and ask the instructor questions. Although these capabilities did not impact the approach to drafting items, they may impact the degree to which learners feel they learned from the assessments in the virtual classroom in comparison to the mobile training. Social cognitive theory (see Bandura, 1986) would support the idea that creating a social presence for learners (i.e., interacting with peers and instructors) would likely have a positive impact on learning, or at least, affective reactions to learning. These interactions can allow learners to learn from each other and to be more engaged in the instruction. In support of this notion, Van Tassel and Schmitz (2013) demonstrated that instructor-learner interactions do in fact impact learner assessments of learning satisfaction. Further, Wei, Chen, and Kinshuk (2012) demonstrated that perceptions of learning interactions in an online classroom (ex. "I often discussed learning issues with others in the online classroom") had a positive impact on actual learning performance.

As with the mobile assessment items, items drafted for the virtual classroom were reviewed by SMEs during the fourth data collection trip. Based on SME comments, items were revised, and item content was finalized. The final virtual classroom check on learning item blueprint is presented below in Table 9.

Table 9
Virtual Classroom Check on Learning Item Blueprint

Check on Learning Assessment	Subordinate Objective	Number of Items
1	1.2.1	11
2	1.2.2	8
3	1.2.3	6
4	1.2.4	2
5	1.2.5	3
6	1.2.7	3
7	1.2.8	5
	Total Number of Items	38

Collaborative scenario. In conjunction with the collaborative scenario development, the assessment team embedded assessments and feedback into the exercise itself. Two main assessment categories for the collaborative scenario were created: individual-level knowledge check questions and team-level radio manipulation tasks. Individual-level knowledge check items were developed as single-answer multiple-choice questions (see Figure 12). Each player completed these individually without communication with other players (i.e., the chat function is disabled until everyone completes the knowledge check questions). All radio manipulation tasks were scored at a team level. These tasks were developed as a series of steps players carried out to successfully complete a vignette (see Figure 13). In each vignette, only one player possessed control of the simulated radio for that vignette. However, the other two players on the team were

able to provide input and collaborate through VoIP, so the players were scored as a team. The final score was determined by the total number of correct steps taken by members of the team. Control of the radio was rotated from player to player as the team progressed through the scenario.

Assessment items were drafted in conjunction with vignettes using the vignette story board process for creation. Following a short video presented at the beginning of each vignette learners are prompted to answer one or two individual-level knowledge check questions. Once all knowledge check questions are completed, the player assigned as the active player for the vignette is granted control of the simulated radio while the other players watch the active player's actions live. Some radio manipulation tasks also involve multiple-choice questions that the active player must answer correctly in order to proceed. For example, to connect or disconnect parts of the radio, a question prompts the player to select the correct physical motion. These process questions are not scored separately and the player may make repeated attempts. The radio manipulation tasks are scored based on whether the overall goal of the task is successfully achieved within the time limit. The task also included animated demonstration-based feedback videos that show how to properly perform the task if it is not completed successfully.

As with the vignette validation for the collaborative scenario, SMEs were provided with vignette assessment items, including both the vignettes and items. Then the flow of the vignette was described and their input was solicited with regard to the realism and feasibility of the vignettes, and the individual-level knowledge check assessment items. The collaborative scenario content was revised and finalized based on SME feedback.

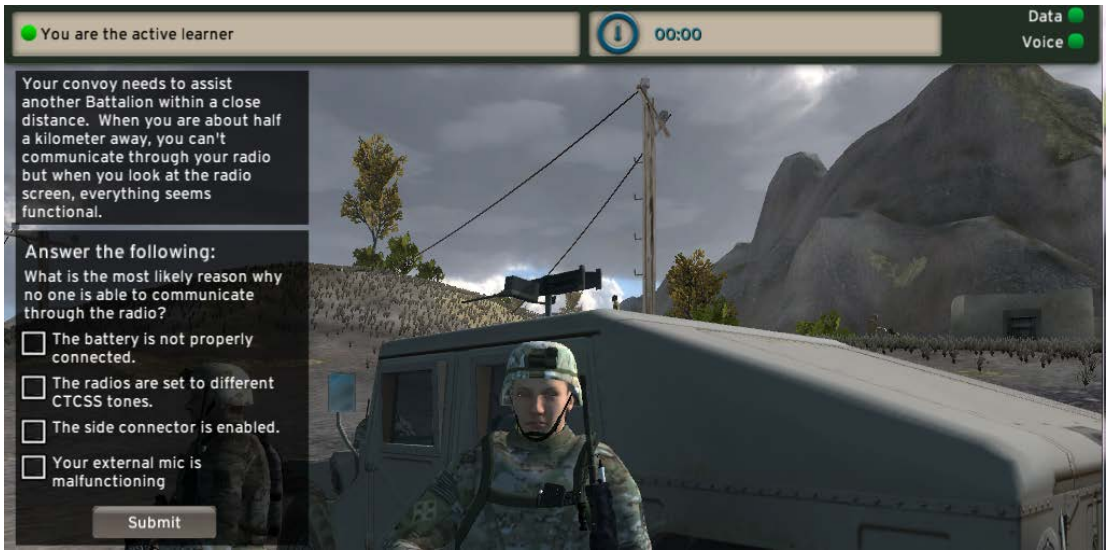


Figure 12: Collaborative scenario: Individual assessment.

Figure 13: Collaborative scenario: Team assessment.

Method

After completing development of full versions of the mobile training, virtual classroom, and collaborative scenario, a beta test was conducted to identify any issues with the training content. The beta test was an opportunity for Soldiers (most with prior experience using the JEM) to review the training materials and provide feedback on the content, appearance / features, functionality, and organization of the training and assessments and to provide critical feedback on the usability of the training modalities.

Participants

Participants in the beta test were recruited by the instructors at Fort Gordon. A total of 21 Soldiers participated and each one completed training on at least one of the three modalities (i.e., mobile, virtual, or collaborative); 13 completed two modalities. In total, the mobile training was completed by 18 Soldiers, the virtual classroom was completed by seven Soldiers, and the collaborative scenario was completed by nine Soldiers. The Soldiers had an average tenure of 10 years in the military, an average of one year in their current rank, and had an average of 3.4 deployments. The ranks of the participants were split between Sergeant First Class (SFC) (n = 9) and Staff Sergeant (SSG) (n = 12). Participants' MOS varied between 25U (Signal Support Systems Specialist; n = 12), 25C (Radio Operator/Maintainer; n = 7), 25B (Information Technology Specialist; n = 1), and 25M (Multimedia Illustrator; n = 1).

Procedure

Participants completed the beta test in groups of three in two locations. They were provided with either iPads or desktop computers, with the group provided iPads completing the

mobile training and those with desktops completing either the virtual classroom or collaborative scenario.

Upon arriving at the testing location, participants were presented with a brief introduction to the project and the purpose of the beta test, followed by an explanation of the tasks they were to complete. Participants were then asked to sign an informed consent. After submitting the signed informed consent, participants received an information packet (see Appendix C) that included an overview of each training prototype and user feedback questions that were to be completed. These questions were written to capture participants overall satisfaction with the training prototypes, as well as collect feedback regarding technical issues, content, instructional design, and overall usability of the training. Participants were provided with instructions to use the feedback form to record any issues observed during the trainings and / or assessments. Upon beginning each training modality, participants logged-in the training platform using a unique username and password. Once logged-in, participants were given a brief overview of how to interact with the technology (i.e., how to use the mobile device) and associated equipment (e.g., headsets). Then participants completed their respective training modality. During all training modalities, researchers recorded notes based on participant feedback. Upon finishing, participants completed an online training reaction questionnaire to record thoughts and opinions about the particular training modality (Appendix D). Participants were instructed to read each question carefully and respond using an agreement scale ranging from 1 (*strongly* disagree) to 5 (*strongly* agree). Upon completion, participants were asked several interview questions regarding their satisfaction with the training. After answering these questions, participants were dismissed.

Mobile training. After receiving the overview information regarding the mobile platform and successfully logging-in to the training platform, participants were given a brief overview of the functionality of the technology (i.e., the iPad). Once participants were familiar with the technology, they proceeded to take the computer adaptive pre-test via the iPad. Following the completion of the pre-test, participants then proceeded to the training content. During this time, participants navigated through the training modules and completed checks on learning when prompted. At the conclusion of the training, participants completed the computer adaptive post-test on the iPad. Then participants completed a reaction questionnaire online. Participants were then asked the following four questions listed at the end of Appendix C:

- Did you find the trainings more or less helpful than traditional classroom learning?
- Did you find the technology to be easy to understand and use?
- What, if anything, would you change about the trainings and assessments?
- Please provide any additional comments you have about the trainings.

The debriefing process was semi-structured to allow participants to expand upon their answers with comments documented on their feedback questionnaire. Upon completion of the debriefing participants were dismissed.

Virtual classroom. Once participants were logged in to the virtual classroom via a desktop computer, they were allowed time to familiarize themselves with the technology. Once familiar, participants completed the computer adaptive pre-test. Following the completion of the pre-test, participants then proceeded to the training content. In the virtual classroom, a researcher served the role of classroom instructor / facilitator. During this training, participants

navigated through the training modules, completed checks on learning when prompted, and interacted with each other and the instructor via headset. At the conclusion of the training, participants completed the computer adaptive post-test within the virtual classroom environment as well as an online questionnaire concerning their reactions to the training. Participants were then debriefed with the four questions listed above.

Collaborative scenario. Following the general training overview and log-in creation, participants in the collaborative scenario completed a pre-recorded tutorial that explained the game features. Here, participants were familiarized with the training content, technology controls, and goals and instructions for the individual and team assessments. After completing the tutorial, participants engaged in the collaborative scenario and proceeded until they completed all the vignettes and associated assessments. As with the previous modalities, participants completed a training reactions online questionnaire at the conclusion of the training. Participants were then debriefed with the same four questions asked after the mobile and virtual classroom (see above).

Results

Responses to the online learner reaction survey were analyzed to better understand user perceptions of the prototype training and identify any potential areas for improvement. Percentages of participants that were favorable (i.e., agreeing or strongly agreeing on positive statements), neutral (i.e., neither agreeing nor disagreeing on positive statements), and unfavorable (i.e., disagreeing or strongly disagreeing on positive statements) were computed for each item. Then the item scores were aggregated to the dimension-level by calculating an average score across all items within that dimension. Results for each topic area on the survey are summarized below; they should be interpreted as preliminary because this was not a full training evaluation.

Technology Usability

In the technology section of the survey, participants were asked to rate five items related to ease of use, accessibility, and functionality of the technology interface. Summary statistics on all items in this section are presented in Table 10. As shown, over 80% of participants indicated favorable attitudes on technology for the mobile and virtual classroom modalities across all questions on this topic. Attitudes were less favorable for the collaborative scenario modality, with slightly over 60% of participants indicating favorable reactions to collaborative technology across all items.

Table 10

Percentages of Favorable Ratings on Technology Usability by Training Modality

Technology	Overall (N = 34)	Mobile (N = 18)	Virtual Classroom (N = 7)	Collaborative Scenario (N = 9)
1. The technology interface was easy to use.	82%	89%	100%	57%
2. The technology allowed for easy review.	82%	89%	86%	67%
3. I was able to access the training with minimum assistance.	88%	100 %	86%	67%
4. I was able to successfully operate the functionality within the training.	74%	67%	100%	67%
5. I am satisfied with the technology interface.	68%	72%	71%	56%
Average Endorsement	79%	83%	89%	62%

During observations and post-training debriefs for the collaborative scenario, some usability issues were uncovered that were likely explanations for the lower ratings on technology for this modality. Participants identified interactions with the virtual radio that were too cumbersome, unintuitive, or different from interacting with the radio physically in the real world. After the beta test, all usability issues identified were systematically reviewed.

Instructional Design

In terms of instructional design, participants were asked about the training content (e.g., the accuracy and effectiveness of the training material) and the presentation (e.g., design, sequence, and motivational effectiveness) of the material. As shown in Table 11, over 80% of participants endorsed the course design for the mobile and collaborative scenario modalities. Attitudes were less positive on the virtual classroom modality, with approximately 70% of participants indicating favorability of the course design for this modality. The majority of participants felt that the virtual classroom course design did not motivate them to learn, and only about 40% of the participants agreed that the material was accurate and current.

Table 11

Percentages of Favorable Ratings on Instructional Design by Training Modality

Instructional Design	Overall (N = 34)	Mobile (N = 18)	Virtual Classroom (N = 7)	Collaborative Scenario (N = 9)
1. The session objectives were met.	91%	94 %	86%	89%
2. The material in this lesson was accurate and current.	71%	78%	43%	78%
3. The design of the training was an effective way to present the subject matter.	74%	67%	71%	89%
4. The material was presented in a logical sequence so that it has helped me understand the subject matter.	91%	100%	86%	78%
5. The media (i.e., graphics and animated sequences) appropriately illustrate the points being discussed.	94%	89%	100%	100%
6. The design and presentation of material motivated me to learn.	65%	72%	43%	67%
7. Overall, I am pleased with the way training was presented.	74%	72%	71%	78%
Average Endorsement	80%	82%	71%	83%

During post-training debriefs, participants raised concerns about some of the virtual classroom content containing unnecessary details. Those participants who completed both the mobile training and the virtual classroom noted that this was especially true for topics that were basic and had already been covered in the mobile training. As a result the length of the virtual classroom modality was too long, which could lead to learner fatigue and loss of attention. For the low ratings on the item about the material being accurate and current, participants were likely referring to the relevance but not the accuracy of the content because the training content is consistent across the three modalities. In light of this finding, the structure of the virtual classroom was revised after the beta test to increase flexibility for the instructor to adjust the level of detail in presenting the material.

On the collaborative scenario, it should also be noted that, despite less favorable perceptions of technology, all participants favored using graphics and animated sequences. This result further indicates that any technology-related issues in the collaborative scenario were likely associated with user functionality rather than the media.

Perceived Learning and Utility

When asked about learning as a result of these training modalities (Table 12), the majority of participants in the mobile modality, slightly over half of participants in the collaborative scenario modality and less than half of participants in the virtual classroom modality indicated they “learned a lot” from the training. However, across all modalities, less

than half of the participants reported that their level of knowledge and perceived ability to apply the strategies and techniques presented to an actual situation changed as a result of the training.

Table 12
Percentages of Favorable Ratings on Perceived Learning Outcomes by Training Modality

Learning	Overall (N = 34)	Mobile (N = 18)	Virtual Classroom (N = 7)	Collaborative Scenario (N = 9)
1. Overall, I have learned a lot from this training.	63%	75%	43%	56%
2. My knowledge of the subject AFTER taking this lesson compared to PRIOR to taking this lesson.	41%	50%	29%	33%
3. My ability to apply the strategies and techniques presented to an actual situation in this subject AFTER taking this lesson compared to PRIOR to taking this lesson.	25%	22%	14%	33%
Average Endorsement	43%	49%	29%	41%

Additionally, slightly more than half of the participants endorsed the practical value of the training and its application on the job across all modalities (see Table 13). The reported lack of learning, training utility, and learning transfer as a result of the training was likely due to the sample used for the beta test. Almost all participants in this sample were 25C or 25U Soldiers with extensive experience with the JEM. Thus, the low levels of changes in knowledge and ability, perceived utility, and learning transfer are likely the result of a pre-training ceiling effect, as these Soldiers were experienced with the JEM prior to engagement in the training. Nevertheless, participants emphasized during debriefs that this training would be valuable as refresher training or an introductory training for lower-level Soldiers.

Table 13

Percentages of Favorable Ratings on Perceived Value and Utility by Training Modality

Value / Utility	Overall (N = 34)	Mobile (N = 18)	Virtual Classroom (N = 7)	Collaborative Scenario (N = 9)
1. It is clear to me that the people conducting the training understand how I will use what I learn.	71%	83.3%	71%	44%
2. This training was relevant to my job in the Army.	79%	89%	71%	67%
3. I believe the training will help me do my current job in the Army better.	56%	31%	43%	56%
4. I learned something I can apply immediately to my work in the Army.	42%	39%	43%	44%
5. I plan to use what I learned on my job in the Army.	53%	56%	43%	56%
6. I get excited when I think about trying to use my new learning on my job in the Army.	56%	61%	43%	56%
7. The training was of practical value to me.	65%	83%	29%	56%
Average Endorsement	60%	63%	49%	54%

Enjoyment and Overall Satisfaction

Overall, results showed that the training was perceived positively despite a few targeted issues mentioned above. As shown in Table 14, the majority of participants indicated that they enjoyed the training and would recommend it to others across all three training modalities. Although participants in the virtual classroom reported lower levels of enjoyment and feelings of "time well spent" compared to the other two modalities, which was most likely due to concerns about the content and length of the training, they would still recommend the training program to other Soldiers.

Table 14

Percentages of Favorable Ratings on Enjoyment and Overall Satisfaction by Training Modality

Enjoyment	Overall (N = 34)	Mobile (N = 18)	Virtual Classroom (N = 7)	Collaborative Scenario (N = 9)
1. I enjoyed this training program.	74%	78%	57%	78%
2. My time on the training was well spent.	71%	78%	43%	78%
3. I would recommend this training program to other Soldiers.	77%	83%	71%	67%
Average Endorsement	74%	80%	57%	74%

Discussion and Lessons Learned

The goal of this project was to develop prototype training leveraging mobile, virtual classroom and gaming-technology that could be used as a test-bed for conducting research on training and assessment strategies outlined in the ALM. The design of the prototypes aligned with principles of the learning sciences and research based practices for assessment; learning opportunities were situated into realistic contexts; assessments were administered on the same platforms as were used to deliver training; frequent testing during training was employed; and the assessments and assessment items were carefully mapped to learning objectives to ensure that assessments measured the constructs of interest.

The following section discusses lessons learned from developing the prototypes. These lessons feel into two broad categories: (1) transitioning existing training content into a virtual format, and (2) using assessments in training.

Transitioning Content to a Virtual Format

The first set of lessons learned reflect issues pertaining to the transfer of information from the classroom version of the training to the virtual version.

A significant challenge in developing the training content was gathering sufficient information regarding how operators use the JEM radio in the field and common troubleshooting tasks that are likely to happen when operating the radio. Although the design team had access to the JEM user manual, training slides, training support packages and an ALC instructor, it would have been beneficial to work with a consistent, core group of SMEs as the content was developed. This would have allowed the research team to draw on a breadth of perspectives and experiences on how the radio is used in the field, while ensuring consistency in the training. While there was access to one individual SME throughout the process, other SMEs rotated in and out. For certain kinds of tasks, for example, those that require a high degree of judgment, this breadth in perspective was beneficial. Basic instruction in the use of a piece of equipment, however, requires depth of expertise and consistency, rather than breadth of perspective. In hindsight, it may have been more effective to have one small, core group of JEM experts work closely with the team as the content was developed. A related challenge was limited access to equipment, specifically the AN/PRC 148 JEM radio.

Lesson 1: Having a small core group of SMEs throughout the project is a desirable approach for training content development.

One major consideration during training development was determining which training content would go into each modality. Our three terminal objectives aligned reasonably well with three different training delivery methods due to the features of these training methods and the characteristics necessitated by the objectives. For example, the ability to access content anytime and anywhere aligned with describing basic features, components, and capabilities. As learners progressed to demonstrate procedures and engage in troubleshooting, the interactive features of the virtual classroom became important. The development of the ISD map was an important step in the alignment of the training content with the training technologies.

Lesson 2: The learning objectives are an important driver of modality selection.

A final challenge was trying to create a collaborative, scenario-based exercise for a task that is not inherently collaborative. This issue was addressed by creating a concept that involved the radio being passed from one learner to another and encouraging the other learners to provide input into the task via a live chat function. This concept of collaborating with peers to learn the radio met the high level learning objective outlined in the ISD Map. In hindsight, a task that is more fundamentally collaborative in nature would have allowed us to make the collaborative scenario more "true to life."

Lesson 3: Collaborative virtual scenarios may be more effective ("true-to-life") if the actual tasks are inherently collaborative in nature.

Using Assessments in Training

Another category of lessons learned reflects our experiences incorporating an array of assessments into emerging training technologies. First, the simulated radio that was built for this training suite afforded the opportunity to incorporate more interactive assessment items than a typical multiple-choice format. One challenge in implementing this was ensuring that learners were measured on their skill and knowledge of the radio, not in using the training / assessment interface. For example, if the task required the learner to connect a cable in order to get a point, the assessment must be designed in such a way that learners do not lose points simply because they did not know how to use the interface to connect the cable (i.e., manipulating a mouse while entering a sequence of keys on the keyboard). Conversely, assessment developers must avoid providing too many hints or instruction about how to perform a certain function because they can "give away" the correct answer. Achieving this balance requires: (a) a skilled, experienced assessment developer to work closely with technology developers and (b) more usability and pilot testing than more traditional tests.

Lesson 4: Embedding step-based assessments within a scenario-based exercise requires a close collaboration between assessment and technology developers, and more usability and pilot testing than more traditional test.

Next, one of the prototype assessments developed in this effort was a CAT. One reason for incorporating a CAT into the training context was to determine if it could be a more efficient way to measure learning. One challenge was that the length of the test depends on the dimensionality of the construct because a separate CAT must be created for each dimension. For example, if a learner incorrectly answers a difficult item on dimension X, the next (easier) item should be from the same dimension (or construct) – not from a completely distinct construct. If training content is multi-dimensional, a CAT will not necessarily be more efficient than a traditional test. A related challenge was that because there was no way to know the true dimensionality of the JEM training content, assumptions were made about it when constructing the CAT. An assumption was made that the various content areas are related to each other and all pertain to a higher-order general ability to use the JEM. The different content areas are represented in the item pool and the same number of items from each content area is drawn for each test. However, the adaptive mechanism functions across content areas (i.e., the item selection from one content area may be based on the response to an item from a different content area). It should be noted that (a) item selection is, in part, based on item difficulty and (b) each content area contained items of similar levels of difficulty. Thus, because it was assumed that all

content areas pertain to a higher order general ability to use the JEM, item selection from one content area (including difficulty) based on the response to an item from another content area should not be problematic. The purpose behind governing the content area representation was simply to counterbalance the items across content areas. However, if factor loadings demonstrated that our content areas did not load onto a single dimension, the results would indicate that cross content item selection may not be appropriate. Specifically, it would lead to CATs that assess trainees unequally.

Lesson 5: Ideally, assessment items should be pilot tested in order to confirm the dimensionality prior to finalizing the CAT.

Conclusions

The purpose of this effort was to develop prototype training with integrated assessments that aligned with the goals of the ALM. For this particular effort, the focus was on redesigning the current training programming for the JEM radio to better meet the vision of the ALM. After creating an ISD map based on current training materials and SME input, our project team was able to match training objectives to training delivery methods (i.e., mobile, virtual classroom, and collaborative scenario), based on the alignment of the objectives and the affordances of the delivery method. Using best practices from the field, our project team then developed the training environments, training content, and respective assessments. Next, we sought to assess our prototype with an Army audience. The prototype training and assessments were beta-tested with a sample of SMEs and instructors from the Signal NCO Academy to assess reactions to the prototype training. Generally speaking, the results demonstrated that the participants expressed a positive view of the training technology, instructional design, and overall enjoyment. Although participants did not express favorable ratings for learning and learning outcomes, this is likely due to (a) the simplistic content of the training itself (i.e., the JEM training is straight forward) and (b) the fact that many participants had extensive experience with the JEM. Because this data was collected during a beta test, these results should be considered preliminary.

The prototypes developed for this effort are intended to be used in future research on training assessments and training effectiveness using emerging training technologies. Specifically, future research will include the following questions:

- Is the prototype training at least as effective as the traditional classroom training?
- Does an adaptive assessment provide value over non-adaptive assessment in a training context?
- Are interim assessments effective for learning?
- What is the most effective “schedule” of assessment?
- Does better performance in the simulation translate to better performance with a real radio?
- Are there any negative effects of practicing on a simulated radio?

Answers to these questions can inform implementation of ALM in that they will increase our understanding of the most appropriate uses of the training and assessment technology resources that exist. The prototypes described here will allow this research to be conducted with tools that leverage best practices in training assessments, enhancing the quality of the research.

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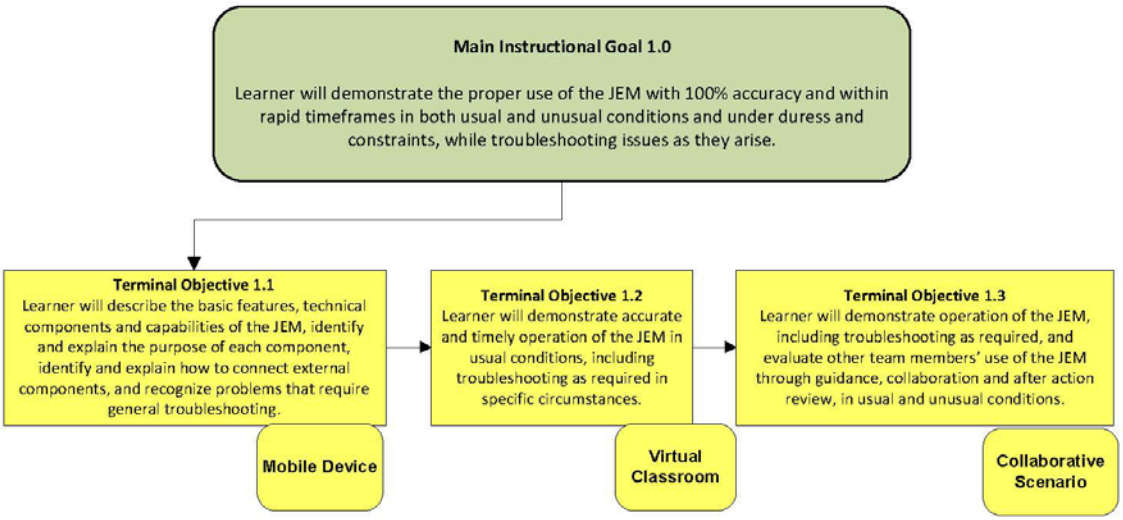
APPENDIX A

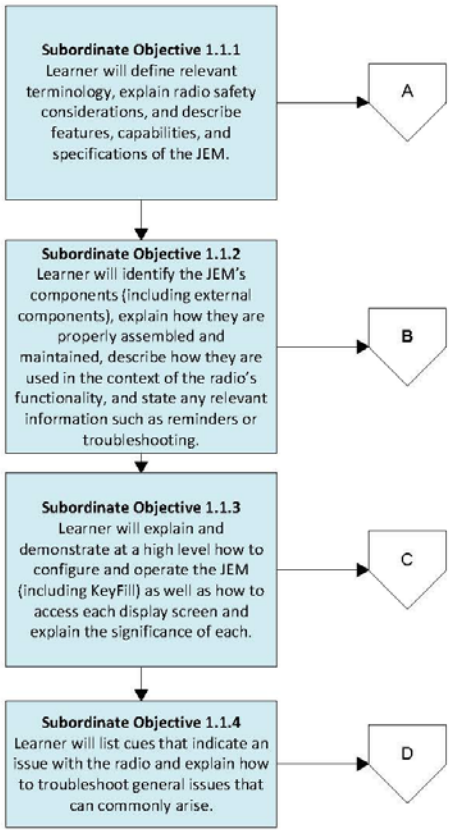
INSTRUCTIONAL DESIGN MAP

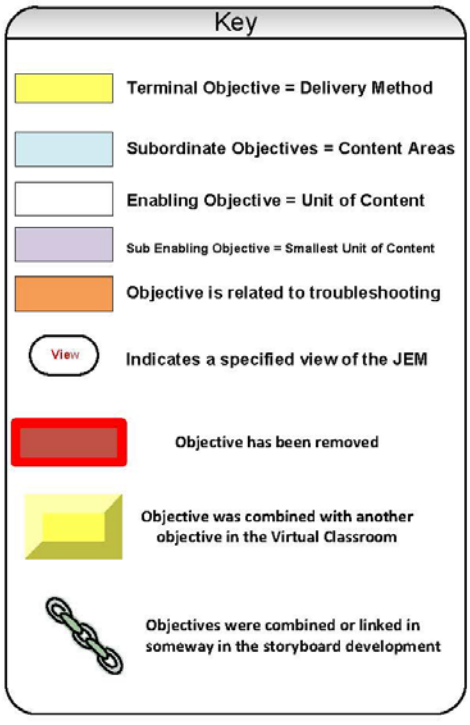
Design Doc
FINAL
12/05/12

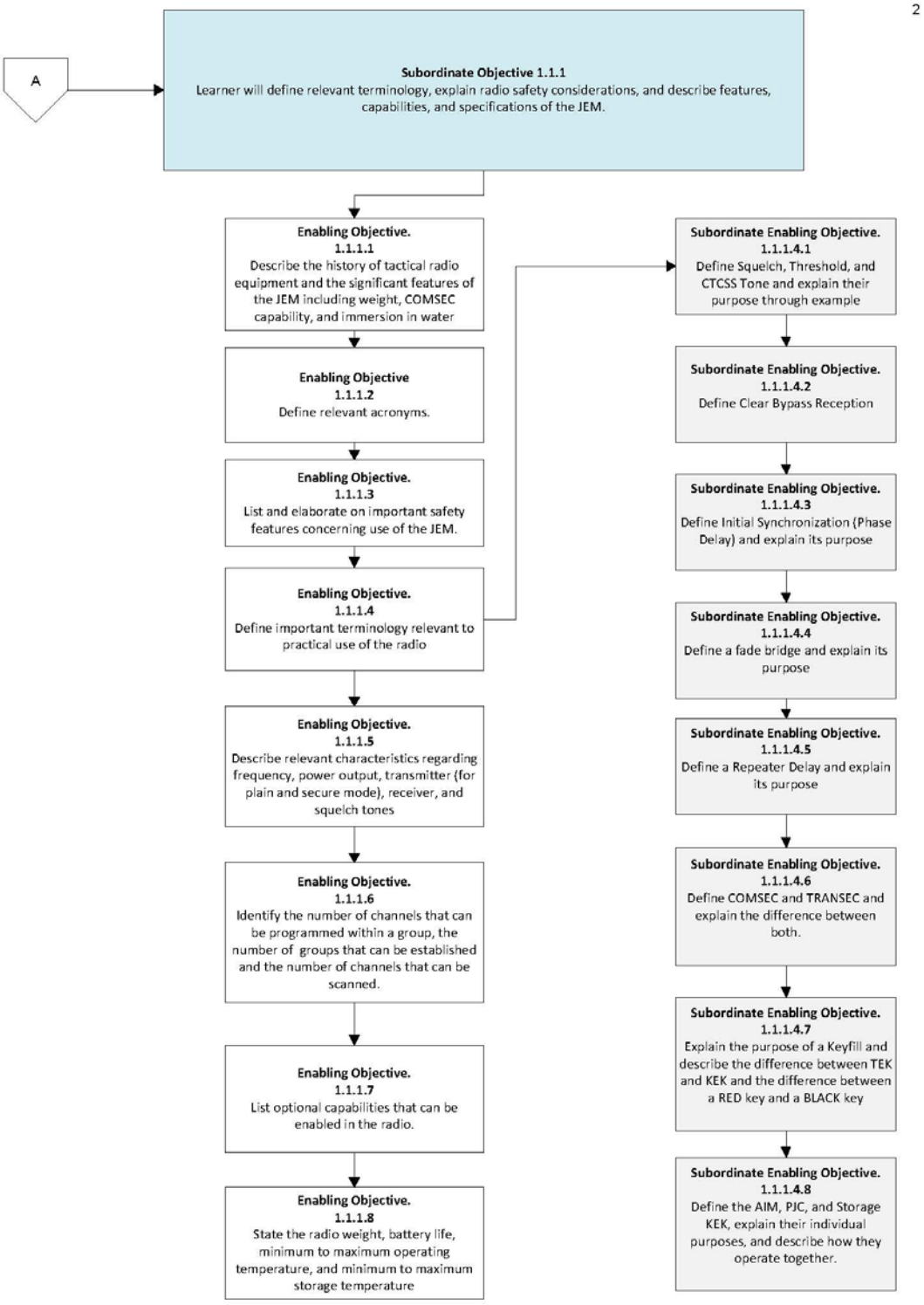
TRAIN II – ASSESSMENTS PROJECT INSTRUCTIONAL DESIGN MAP

Learning Objective Decomposition for AN/PRC-148 JEM Training

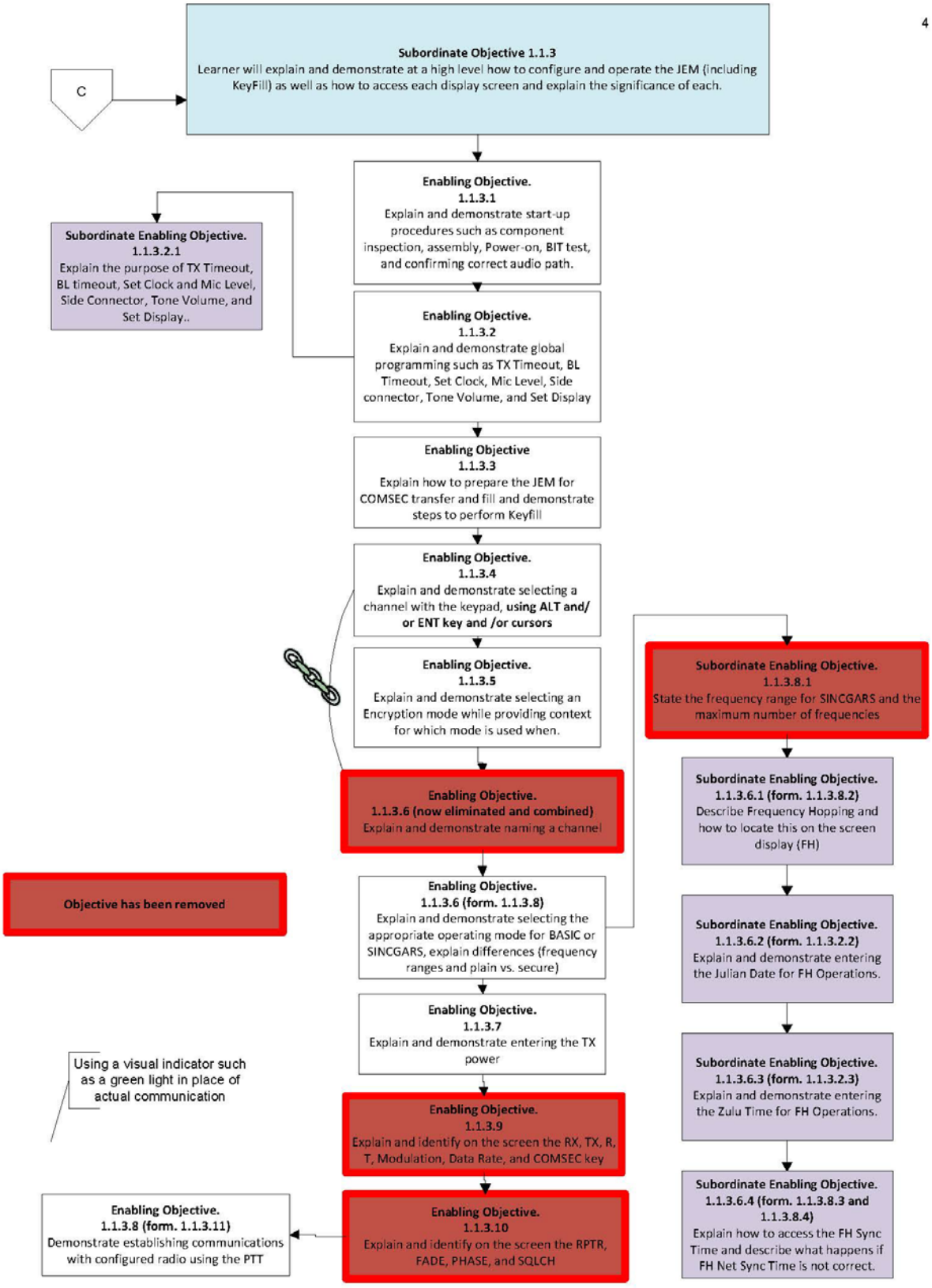




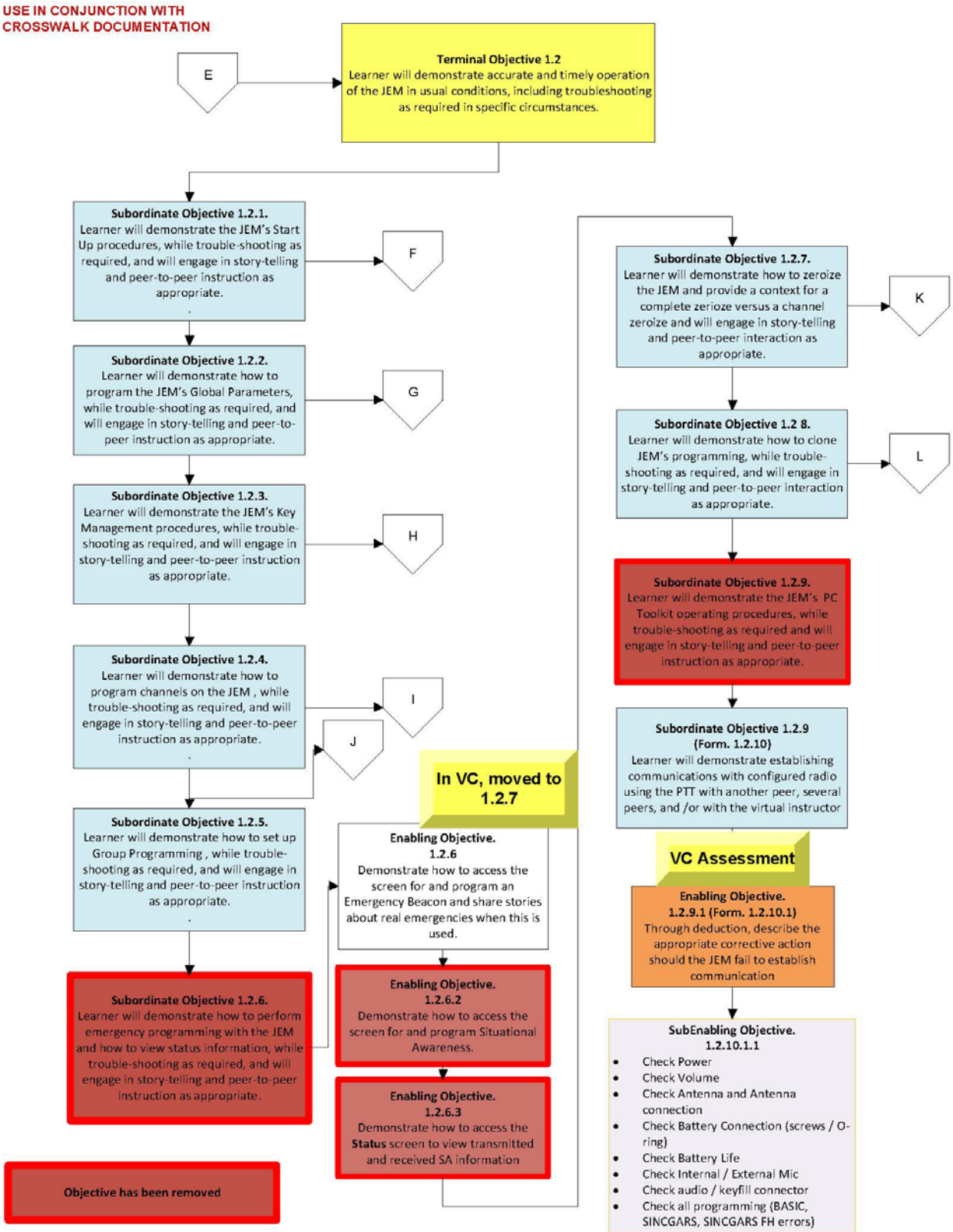


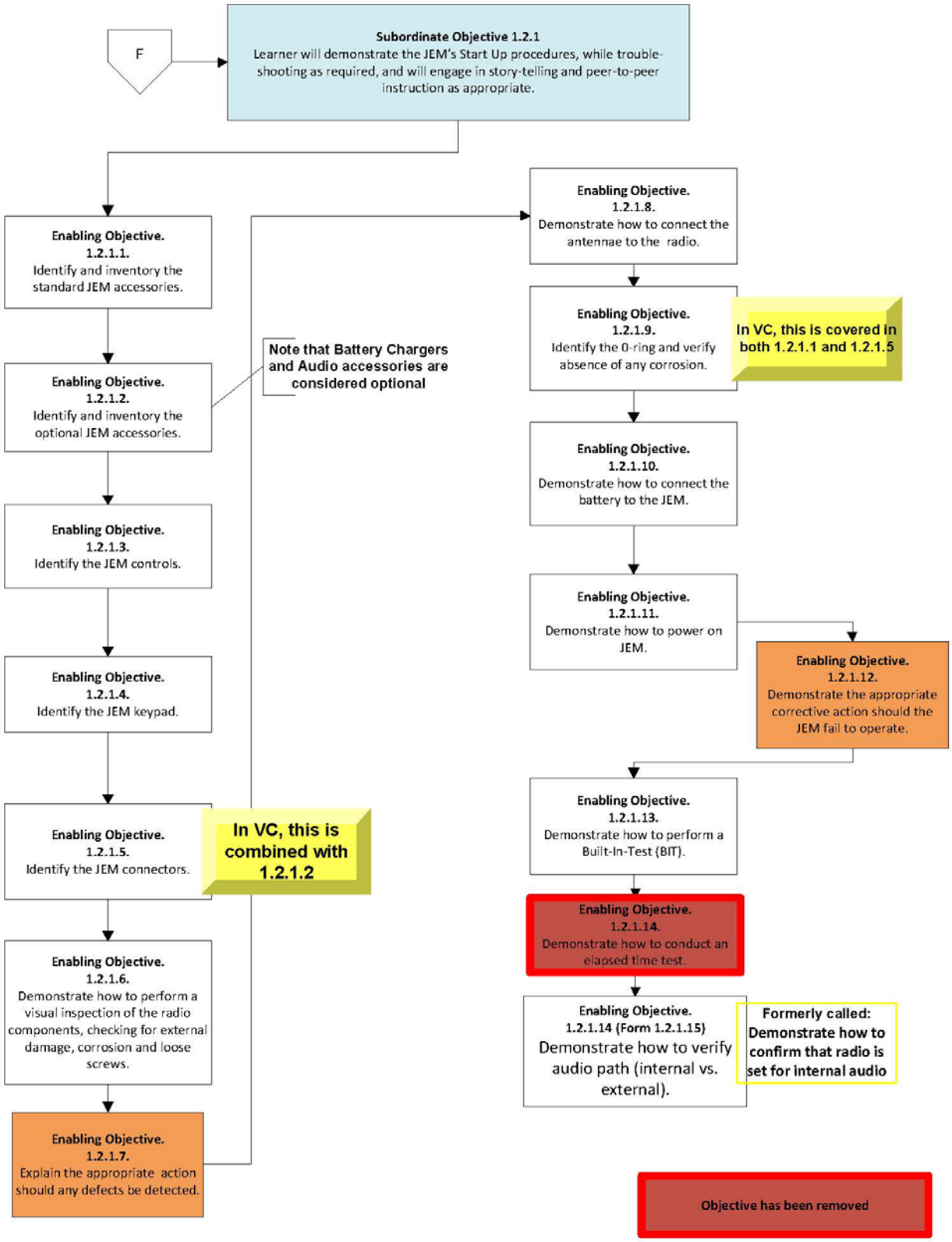

A
Subordinate Objective 1.1.1
Learner will define relevant terminology, explain radio safety considerations, and describe features, capabilities, and specifications of the JEM.
Enabling Objective. 1.1.1.1
Describe the history of tactical radio equipment and the significant features of the JEM including weight, COMSEC capability, and immersion in water
Enabling Objective 1.1.1.2
Define relevant acronyms.
Enabling Objective. 1.1.1.3
List and elaborate on important safety features concerning use of the JEM.
Enabling Objective. 1.1.1.4
Define important terminology relevant to practical use of the radio
Enabling Objective. 1.1.1.5
Describe relevant characteristics regarding frequency, power output, transmitter (for plain and secure mode), receiver, and squelch tones
Enabling Objective. 1.1.1.6
Identify the number of channels that can be programmed within a group, the number of groups that can be established and the number of channels that can be scanned.
Enabling Objective. 1.1.1.7
List optional capabilities that can be enabled in the radio.
Enabling Objective. 1.1.1.8
State the radio weight, battery life, minimum to maximum operating temperature, and minimum to maximum storage temperature
Subordinate Enabling Objective. 1.1.1.4.1
Define Squelch, Threshold, and CTCSS Tone and explain their purpose through example
Subordinate Enabling Objective. 1.1.1.4.2
Define Clear Bypass Reception
Subordinate Enabling Objective. 1.1.1.4.3
Define Initial Synchronization (Phase Delay) and explain its purpose
Subordinate Enabling Objective. 1.1.1.4.4
Define a fade bridge and explain its purpose
Subordinate Enabling Objective. 1.1.1.4.5
Define a Repeater Delay and explain its purpose
Subordinate Enabling Objective. 1.1.1.4.6
Define COMSEC and TRANSEC and explain the difference between both.
Subordinate Enabling Objective. 1.1.1.4.7
Explain the purpose of a Keyfill and describe the difference between TEK and KEK and the difference between a RED key and a BLACK key
Subordinate Enabling Objective. 1.1.1.4.8
Define the AIM, PJC, and Storage KEK, explain their individual purposes, and describe how they operate together.

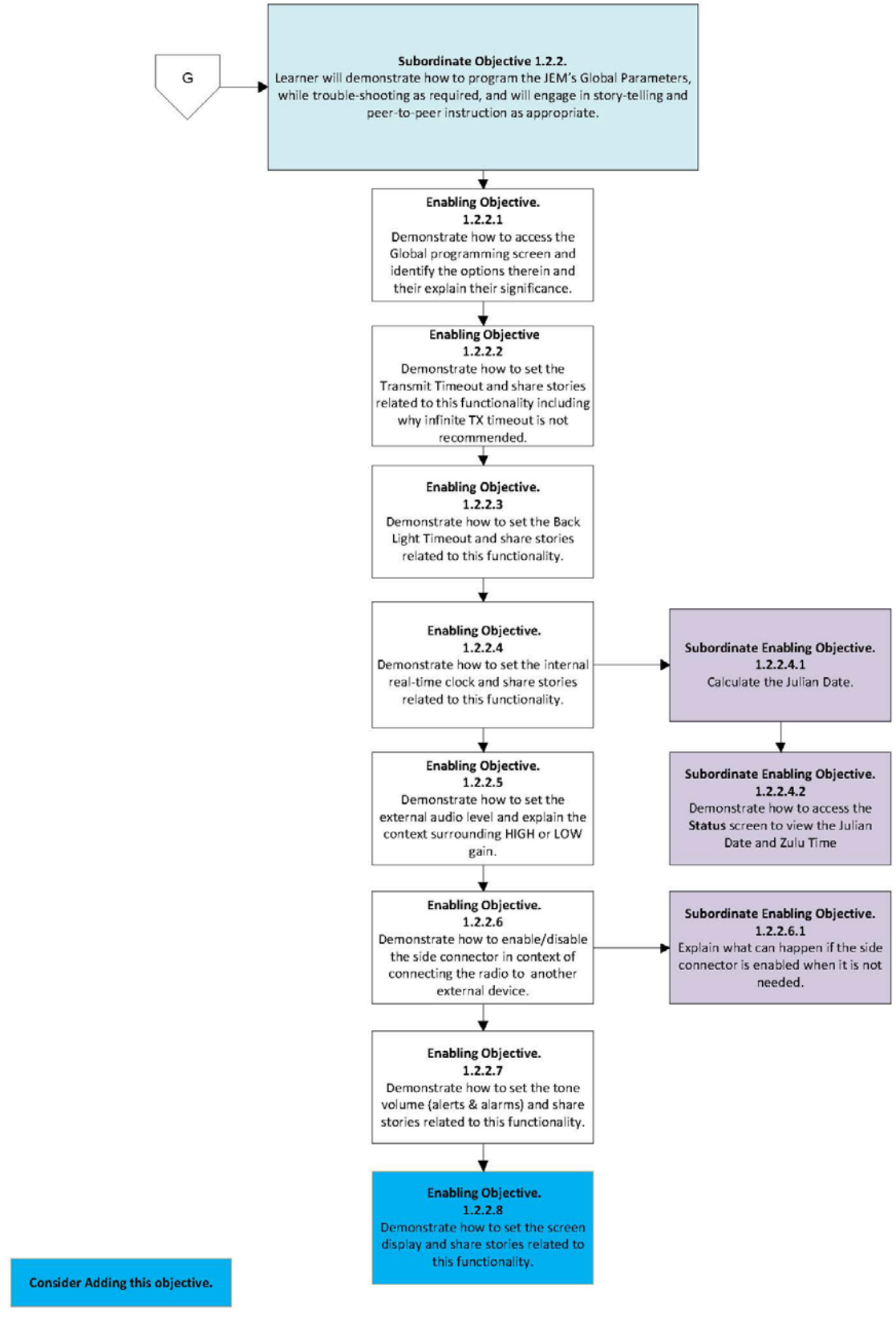
B
Subordinate Objective 1.1.2
Learner will identify the JEM's components (including external components), explain how they are properly assembled and maintained, describe how they are used in the context of the radio's functionality, and state any relevant information such as reminders or troubleshooting.
A = Controls
B = Indicators
C=Connectors
Enabling Objective. A.1.1.2.1 Identify the On/Off button, Volume Control, and Panic Zeroize, describe their use in context, and state any relevant information such as reminders or troubleshooting
Enabling Objective. A.1.1.2.2 Identify the 16-position Channel Select control, describe its use in context, and state any relevant information such as reminders or troubleshooting.
Enabling Objective. A.1.1.2.3 Identify the internal speaker-MC, describe its use in context, and state any relevant information such as reminders or troubleshooting.
Enabling Objective. A.1.1.2.4 Identify the Keypad, describe each function key, describe their use in context, and state any relevant information such as reminders or troubleshooting.
Enabling Objective. A.1.1.2.5 Identify the Mechanical Interlock, describe its use in context with Zeroize function, and state any relevant information such as reminders or troubleshooting.
Enabling Objective. A.1.1.2.6 Identify the 2 Programmable Function Keys, describe their use in context, and state any relevant information such as reminders or troubleshooting.
Enabling Objective. A.1.1.2.6 (Form. A.1.1.2.7) Identify the Push To Talk (PTT) control, describe its use in context, and state any relevant information such as reminders or troubleshooting.
Enabling Objective. A.1.1.2.7 (Form. A.1.1.2.8) Identify the Squelch Disable Button, describe its use in context, and state any relevant information such as reminders or troubleshooting
Objective has been removed
Enabling Objective. B.1.1.2.1 Identify the Liquid Crystal Display (LCD), describe its use in context, and state any relevant information such as reminders or troubleshooting
Enabling Objective. B.1.1.2.2 Describe the use of the lamp function and explain when and when not to use it.
Enabling Objective. B.1.1.2.3 Identify and describe each audible indicator and state any relevant information such as what to do pursuant to the audible indicator in context
Side View Enabling Objective. C.1.1.2.10 Identify the RF connector and describe its use in context, including which external cables/ devices connect to the RF connector.
Top View Enabling Objective. C.1.1.2.11 Identify the Audio/Keyfill connector and explain its use in context for both external audio connector and Keyfill connector
Top View Enabling Objective. C.1.1.2.12 List and identify external audio devices, explain how they are connected (including switch to external audio), and state relevant information such as reminders and troubleshooting
Top View Enabling Objective. C.1.1.2.13 Identify the SKL KeyFill device, explain how it is connected, and state relevant information such as reminders and troubleshooting.
Side View Enabling Objective. C.1.1.2.14 Identify the Cloning Cable, explain how to set up both radios for cloning, explain how to connect the radios with the cloning cable, and state relevant information such as reminders and troubleshooting
Bottom View Enabling Objective. C.1.1.2.1 (form. C.1.1.2.3) Identify the Battery, describe the O-ring, explain how to recognize a damaged O-ring and state any relevant information
Bottom View Enabling Objective. C.1.1.2.2. (form. C.1.1.2.4) Identify the battery connector on the radio, explain how to connect the battery (90 degree angle and turn), explain how to ensure screws are tightened, and state the consequences for loose screws.
Top View Enabling Objective. C.1.1.2.3 (form. C.1.1.2.1) Identify the Antenna connector, explain different types of antennae, describe its use in context, and state any relevant information such as reminders or troubleshooting
Top view Enabling Objective. C.1.1.2.4 (form. C.1.1.2.2) Describe how connect / remove the antenna.
Side View Enabling Objective. C.1.1.2.5 Identify the battery latch and explain when it is used and how to use it
Enabling Objective. C.1.1.2.6 Describe how to maintain the external battery, including charging and list common contributors to battery drainage (other than actual communications).
Enabling Objective. C.1.1.2.7 Describe the Hold-Up Battery (HUB) and explain how to maintain it.
Side View Enabling Objective. C.1.1.2.8 Identify the data plate, serial number & NSN explain its significance
Side View Enabling Objective. C.1.1.2.9 Identify the Side Connector, explain how to enable it, describe its use in context, including what external cables / devices connect to the Side Connector including Cloning Cable.

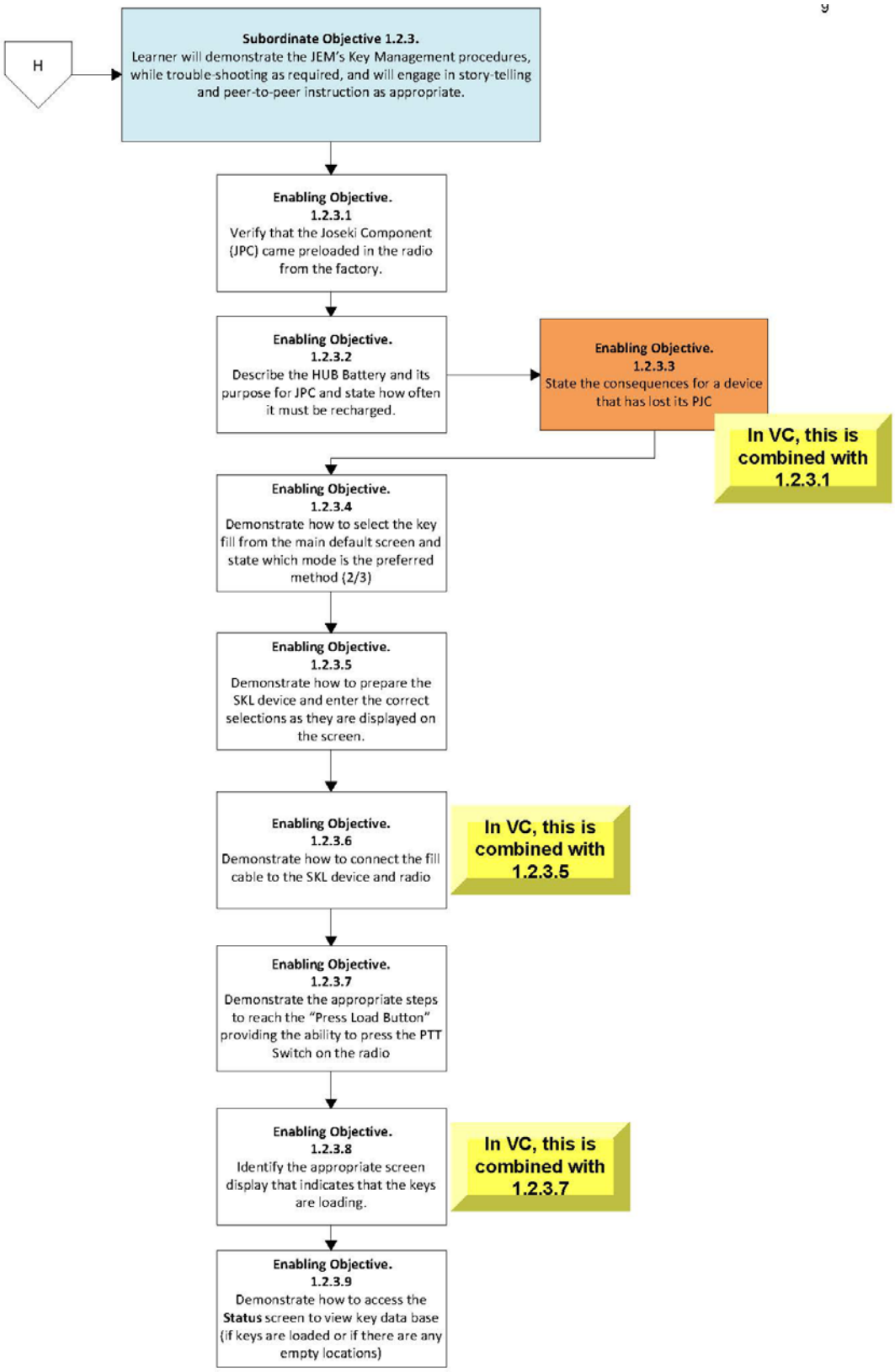

C
Subordinate Objective 1.1.3
Learner will explain and demonstrate at a high level how to configure and operate the JEM (including KeyFill) as well as how to access each display screen and explain the significance of each.
Enabling Objective. 1.1.3.1
Explain and demonstrate start-up procedures such as component inspection, assembly, Power-on, BIT test, and confirming correct audio path.
Subordinate Enabling Objective. 1.1.3.2.1
Explain the purpose of TX Timeout, BL timeout, Set Clock and Mic Level, Side Connector, Tone Volume, and Set Display..
Enabling Objective. 1.1.3.2
Explain and demonstrate global programming such as TX Timeout, BL Timeout, Set Clock, Mic Level, Side connector, Tone Volume, and Set Display
Enabling Objective 1.1.3.3
Explain how to prepare the JEM for COMSEC transfer and fill and demonstrate steps to perform Keyfill
Enabling Objective. 1.1.3.4
Explain and demonstrate selecting a channel with the keypad, using ALT and/ or ENT key and /or cursors
Enabling Objective. 1.1.3.5
Explain and demonstrate selecting an Encryption mode while providing context for which mode is used when.
Enabling Objective. 1.1.3.6 (now eliminated and combined)
Explain and demonstrate naming a channel
Objective has been removed
Enabling Objective. 1.1.3.6 (form. 1.1.3.8)
Explain and demonstrate selecting the appropriate operating mode for BASIC or SINCGARS, explain differences (frequency ranges and plain vs. secure)
Enabling Objective. 1.1.3.7
Explain and demonstrate entering the TX power
Using a visual indicator such as a green light in place of actual communication
Enabling Objective. 1.1.3.9
Explain and identify on the screen the RX, TX, R, T, Modulation, Data Rate, and COMSEC key
Enabling Objective. 1.1.3.10
Explain and identify on the screen the RPTR, FADE, PHASE, and SQLCH
Enabling Objective. 1.1.3.8 (form. 1.1.3.11)
Demonstrate establishing communications with configured radio using the PTT
Subordinate Enabling Objective. 1.1.3.8.1
State the frequency range for SINCGARS and the maximum number of frequencies
Subordinate Enabling Objective. 1.1.3.6.1 (form. 1.1.3.8.2)
Describe Frequency Hopping and how to locate this on the screen display (FH)
Subordinate Enabling Objective. 1.1.3.6.2 (form. 1.1.3.2.2)
Explain and demonstrate entering the Julian Date for FH Operations.
Subordinate Enabling Objective. 1.1.3.6.3 (form. 1.1.3.2.3)
Explain and demonstrate entering the Zulu Time for FH Operations.
Subordinate Enabling Objective. 1.1.3.6.4 (form. 1.1.3.8.3 and 1.1.3.8.4)
Explain how to access the FH Sync Time and describe what happens if FH Net Sync Time is not correct.

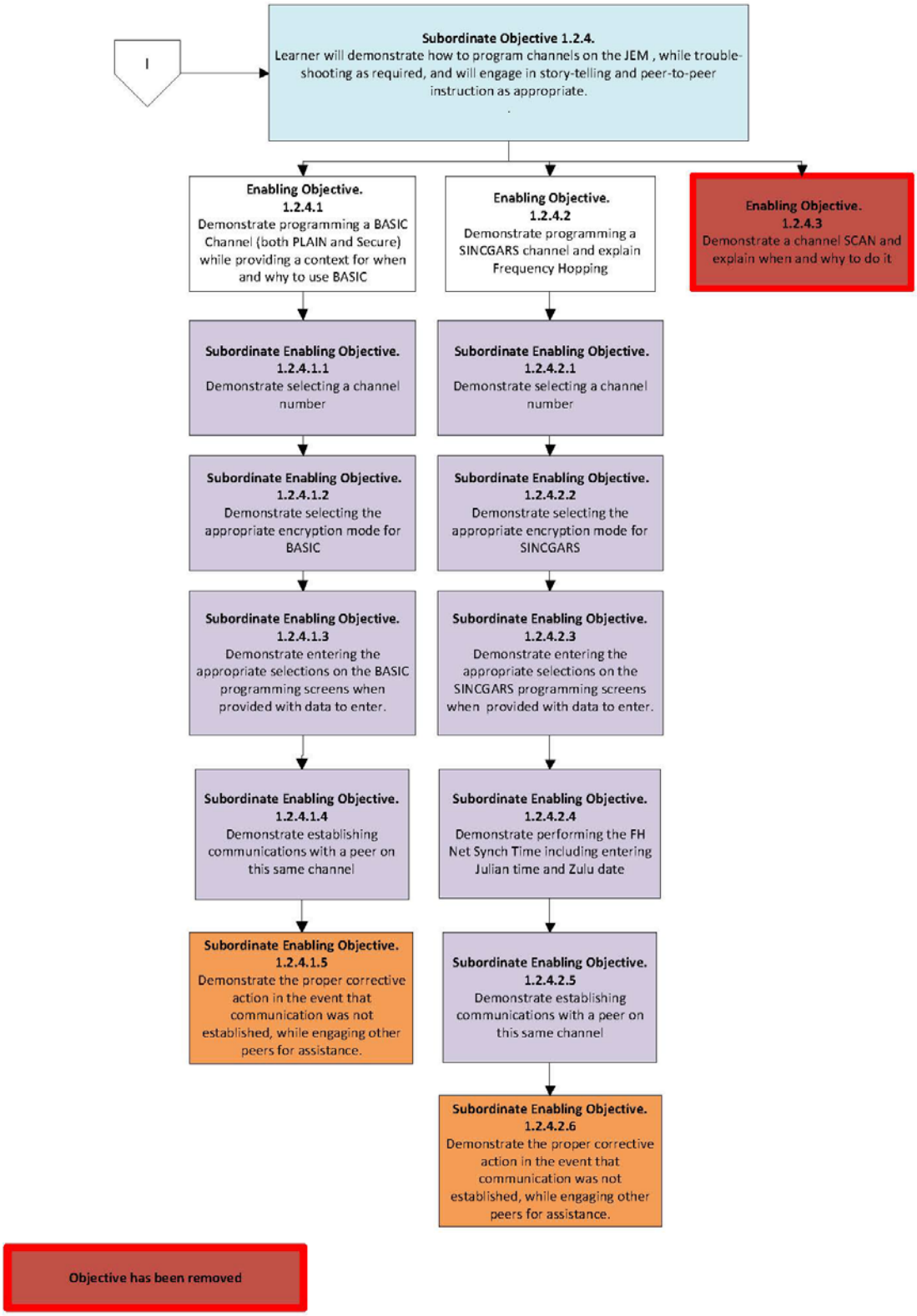
D
Subordinate Objective 1.1.4
Learner will list cues that indicate an issue with the radio and explain how to troubleshoot general issues that can commonly arise.
A =Obvious
B = Indicated
C = Key or Cloning related
Enabling Objective. A.1.1.4.1
Through deduction, describe the appropriate corrective action should the JEM fail to establish communication with regard to General Physical Aspects
SubEnabling Objective. A.1.1.4.1.1
Check Power
Check Volume
Check Antenna and Antenna connection
Check Battery Connection (screws / O-ring)
Check Battery Life
Check Internal / External Mic
Check audio / keyfill connector
Enabling Objective. A.1.1.4.2
Describe the appropriate corrective action should the learner be unable to communicate with other radio user in BASIC mode (either plain or secure mode)
Enabling Objective. A.1.1.4.3
Describe the appropriate corrective action should the learner be unable to communicate with other radio users in SINCGARS mode (plain or secure)
Enabling Objective. A.1.1.4.4
Describe the appropriate corrective action should the learner be unable to communicate with other radio users in frequency-hopping (FH) SINCGARS mode.
Enabling Objective. A.1.1.4.5
Describe the appropriate corrective action in the event of interference between radios during retransmission.
Enabling Objective. A.1.1.4.6
Describe the appropriate corrective action in the event of a limited talk range.
Enabling Objective. A.1.1.4.7
Describe the appropriate corrective action in the event of background noise or other traffic on the radio.
Enabling Objective. B.1.1.4.1
Describe the appropriate corrective action should the JEM lock up or keypad is locked.
Enabling Objective. B.1.1.4.2
Describe the appropriate corrective action in the event of a flashing "UNLCK" message on the LCD.
Enabling Objective. B.1.1.4.3
Describe the appropriate corrective action in the event of a flashing "ALARM" message on the LCD.
Enabling Objective. B.1.1.4.4
Describe the appropriate corrective action in the event of a flashing "ERROR" message on the LCD.
Enabling Objective. B.1.1.4.5
Describe the appropriate corrective action in the event of a flashing "NOPWR" message in the lower left of the Transmit screen.
Enabling Objective. B.1.1.4.6
Describe the appropriate corrective action in the event of a flashing "NOPJC" message on the LCD.
Enabling Objective. B.1.1.4.7
Describe the appropriate corrective action in the event of a flashing "NOKEY" message on the LCD.
Enabling Objective. B.1.1.4.8
Describe the appropriate corrective action in the event of a flashing "TRSEC" message when a SINCGARS channel is selected.
Enabling Objective. B.1.1.4.9
Describe the appropriate corrective action in the event of a flashing "TEMP" message in the lower left of the Transmit screen.
Enabling Objective. C.1.1.4.1
Describe the appropriate corrective action if errors occur during Keyfill Operation *
Enabling Objective. C.1.1.4.2
Describe the appropriate corrective action should the Radio drop a COMSEC key when changing batteries.
Enabling Objective. C.1.1.4.3
Describe the appropriate corrective action should the Radio not accept a valid COMSEC key.
Enabling Objective. C.1.1.4.2 (form. C.1.1.4.4)
Describe the appropriate corrective action if errors occur during Cloning Operation*
*The wording of this objective has changed to distinguish between Key fill errors and Cloning errors
Objective has been removed

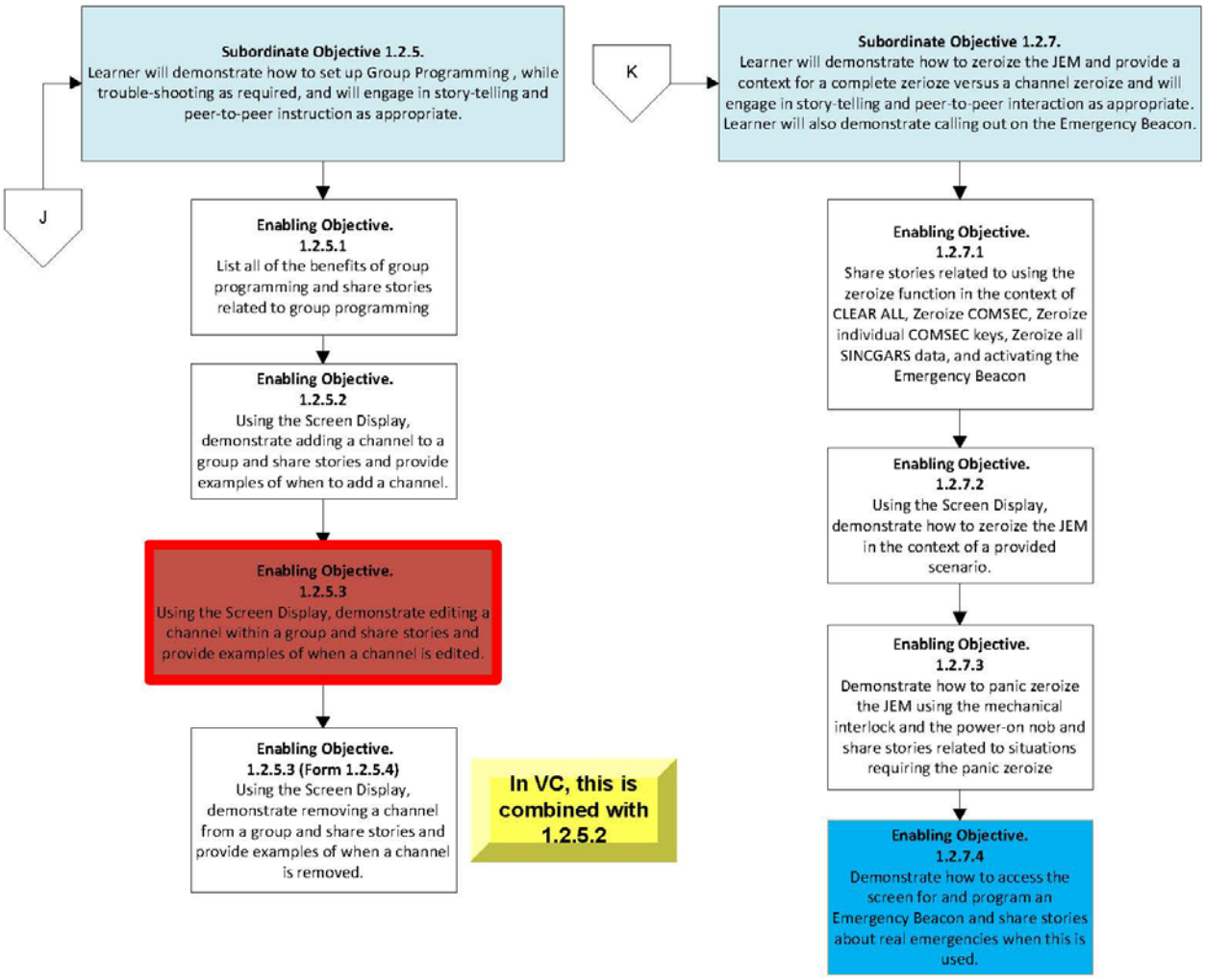

USE IN CONJUNCTION WITH CROSSWALK DOCUMENTATION
E
Terminal Objective 1.2
Learner will demonstrate accurate and timely operation of the JEM in usual conditions, including troubleshooting as required in specific circumstances.
Subordinate Objective 1.2.1.
Learner will demonstrate the JEM's Start Up procedures, while trouble-shooting as required, and will engage in story-telling and peer-to-peer instruction as appropriate.
F
Subordinate Objective 1.2.2.
Learner will demonstrate how to program the JEM's Global Parameters, while trouble-shooting as required, and will engage in story-telling and peer-to-peer instruction as appropriate.
G
Subordinate Objective 1.2.3.
Learner will demonstrate the JEM's Key Management procedures, while trouble-shooting as required, and will engage in story-telling and peer-to-peer instruction as appropriate.
H
Subordinate Objective 1.2.4.
Learner will demonstrate how to program channels on the JEM , while trouble-shooting as required, and will engage in story-telling and peer-to-peer instruction as appropriate.
I
J
Subordinate Objective 1.2.5.
Learner will demonstrate how to set up Group Programming , while trouble-shooting as required, and will engage in story-telling and peer-to-peer instruction as appropriate.
Subordinate Objective 1.2.6.
Learner will demonstrate how to perform emergency programming with the JEM and how to view status information, while trouble-shooting as required, and will engage in story-telling and peer-to-peer instruction as appropriate.
In VC, moved to 1.2.7
Enabling Objective.
1.2.6
Demonstrate how to access the screen for and program an Emergency Beacon and share stories about real emergencies when this is used.
Enabling Objective.
1.2.6.2
Demonstrate how to access the screen for and program Situational Awareness.
Enabling Objective.
1.2.6.3
Demonstrate how to access the Status screen to view transmitted and received SA information
Objective has been removed
Subordinate Objective 1.2.7.
Learner will demonstrate how to zeroize the JEM and provide a context for a complete zerioze versus a channel zeroize and will engage in story-telling and peer-to-peer interaction as appropriate.
K
Subordinate Objective 1.2 8.
Learner will demonstrate how to clone JEM's programming, while trouble-shooting as required, and will engage in story-telling and peer-to-peer interaction as appropriate.
L
Subordinate Objective 1.2.9.
Learner will demonstrate the JEM's PC Toolkit operating procedures, while trouble-shooting as required and will engage in story-telling and peer-to-peer instruction as appropriate.
Subordinate Objective 1.2.9 (Form. 1.2.10)
Learner will demonstrate establishing communications with configured radio using the PTT with another peer, several peers, and /or with the virtual instructor
VC Assessment
Enabling Objective.
1.2.9.1 (Form. 1.2.10.1)
Through deduction, describe the appropriate corrective action should the JEM fail to establish communication
SubEnabling Objective.
1.2.10.1.1
Check Power
Check Volume
Check Antenna and Antenna connection
Check Battery Connection (screws / O-ring)
Check Battery Life
Check Internal / External Mic
Check audio / keyfill connector
Check all programming (BASIC, SINCGARS, SINCGARS FH errors)


F
Subordinate Objective 1.2.1
Learner will demonstrate the JEM's Start Up procedures, while trouble-shooting as required, and will engage in story-telling and peer-to-peer instruction as appropriate.
Enabling Objective. 1.2.1.1. Identify and inventory the standard JEM accessories.
Enabling Objective. 1.2.1.2. Identify and inventory the optional JEM accessories.
Note that Battery Chargers and Audio accessories are considered optional
Enabling Objective. 1.2.1.3. Identify the JEM controls.
Enabling Objective. 1.2.1.4. Identify the JEM keypad.
Enabling Objective. 1.2.1.5. Identify the JEM connectors.
In VC, this is combined with 1.2.1.2
Enabling Objective. 1.2.1.6. Demonstrate how to perform a visual inspection of the radio components, checking for external damage, corrosion and loose screws.
Enabling Objective. 1.2.1.7. Explain the appropriate action should any defects be detected.
Enabling Objective. 1.2.1.8. Demonstrate how to connect the antennae to the radio.
Enabling Objective. 1.2.1.9. Identify the O-ring and verify absence of any corrosion.
In VC, this is covered in both 1.2.1.1 and 1.2.1.5
Enabling Objective. 1.2.1.10. Demonstrate how to connect the battery to the JEM.
Enabling Objective. 1.2.1.11. Demonstrate how to power on JEM.
Enabling Objective. 1.2.1.12. Demonstrate the appropriate corrective action should the JEM fail to operate.
Enabling Objective. 1.2.1.13. Demonstrate how to perform a Built-In-Test (BIT).
Enabling Objective. 1.2.1.14. Demonstrate how to conduct an elapsed time test.
Enabling Objective. 1.2.1.14 (Form 1.2.1.15) Demonstrate how to verify audio path (internal vs. external).
Formerly called: Demonstrate how to confirm that radio is set for internal audio
Objective has been removed


G
Subordinate Objective 1.2.2.
Learner will demonstrate how to program the JEM's Global Parameters, while trouble-shooting as required, and will engage in story-telling and peer-to-peer instruction as appropriate.
Enabling Objective.
1.2.2.1
Demonstrate how to access the Global programming screen and identify the options therein and their explain their significance.
Enabling Objective
1.2.2.2
Demonstrate how to set the Transmit Timeout and share stories related to this functionality including why infinite TX timeout is not recommended.
Enabling Objective.
1.2.2.3
Demonstrate how to set the Back Light Timeout and share stories related to this functionality.
Enabling Objective.
1.2.2.4
Demonstrate how to set the internal real-time clock and share stories related to this functionality.
Subordinate Enabling Objective.
1.2.2.4.1
Calculate the Julian Date.
Subordinate Enabling Objective.
1.2.2.4.2
Demonstrate how to access the Status screen to view the Julian Date and Zulu Time
Enabling Objective.
1.2.2.5
Demonstrate how to set the external audio level and explain the context surrounding HIGH or LOW gain.
Enabling Objective.
1.2.2.6
Demonstrate how to enable/disable the side connector in context of connecting the radio to another external device.
Subordinate Enabling Objective.
1.2.2.6.1
Explain what can happen if the side connector is enabled when it is not needed.
Enabling Objective.
1.2.2.7
Demonstrate how to set the tone volume (alerts & alarms) and share stories related to this functionality.
Enabling Objective.
1.2.2.8
Demonstrate how to set the screen display and share stories related to this functionality.
Consider Adding this objective.

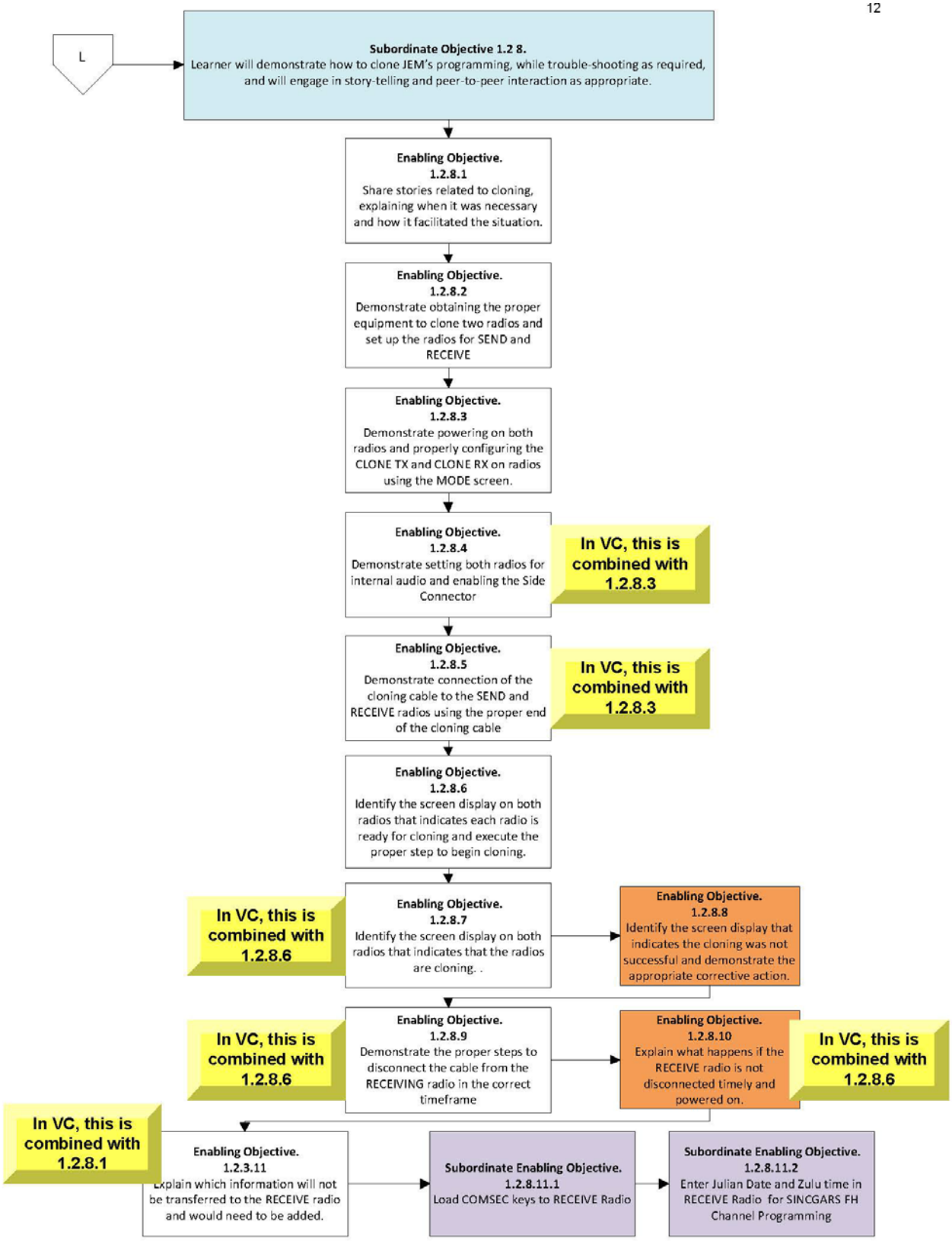

H
Subordinate Objective 1.2.3.
Learner will demonstrate the JEM's Key Management procedures, while trouble-shooting as required, and will engage in story-telling and peer-to-peer instruction as appropriate.
Enabling Objective. 1.2.3.1
Verify that the Joseki Component (JPC) came preloaded in the radio from the factory.
Enabling Objective. 1.2.3.2
Describe the HUB Battery and its purpose for JPC and state how often it must be recharged.
Enabling Objective. 1.2.3.3
State the consequences for a device that has lost its PJC
In VC, this is combined with 1.2.3.1
Enabling Objective. 1.2.3.4
Demonstrate how to select the key fill from the main default screen and state which mode is the preferred method (2/3)
Enabling Objective. 1.2.3.5
Demonstrate how to prepare the SKL device and enter the correct selections as they are displayed on the screen.
Enabling Objective. 1.2.3.6
Demonstrate how to connect the fill cable to the SKL device and radio
In VC, this is combined with 1.2.3.5
Enabling Objective. 1.2.3.7
Demonstrate the appropriate steps to reach the "Press Load Button" providing the ability to press the PTT Switch on the radio
Enabling Objective. 1.2.3.8
Identify the appropriate screen display that indicates that the keys are loading.
In VC, this is combined with 1.2.3.7
Enabling Objective. 1.2.3.9
Demonstrate how to access the Status screen to view key data base (if keys are loaded or if there are any empty locations)

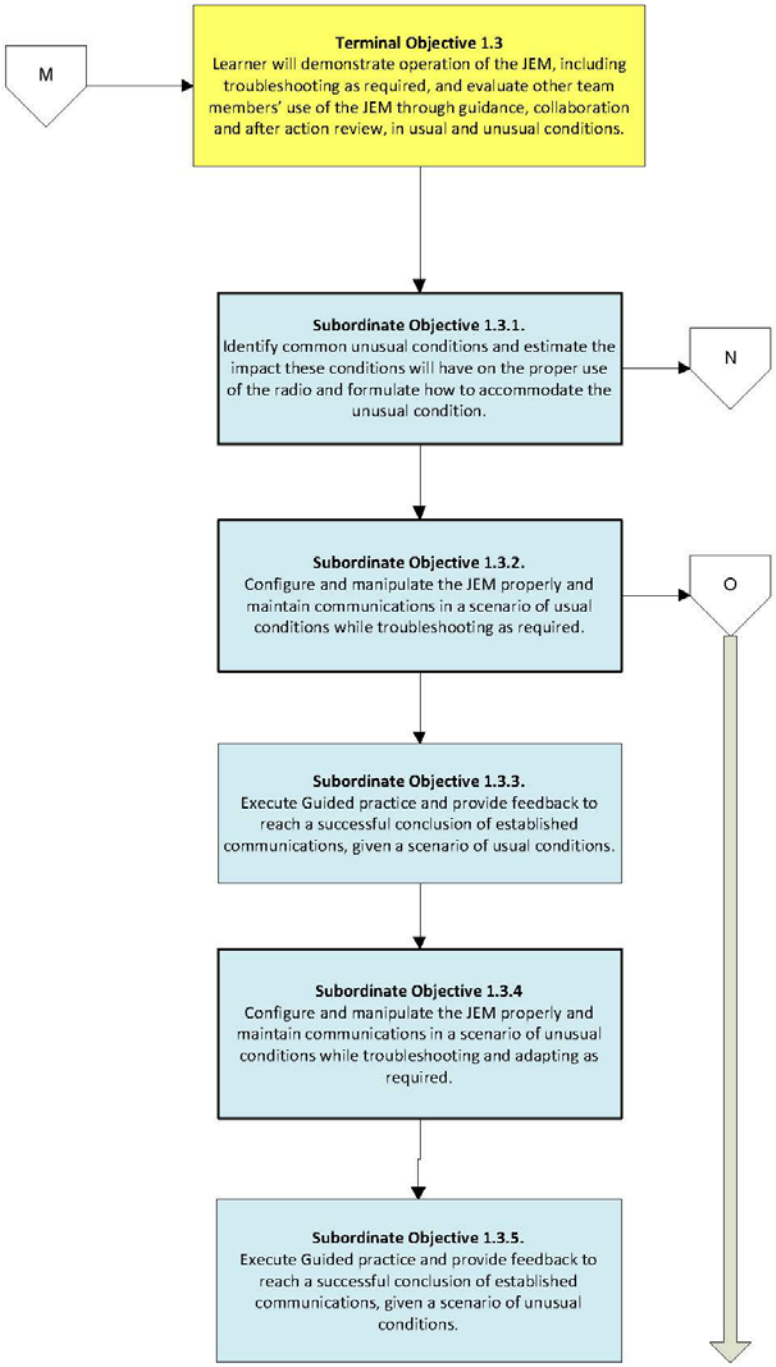

I
Subordinate Objective 1.2.4.
Learner will demonstrate how to program channels on the JEM , while trouble-shooting as required, and will engage in story-telling and peer-to-peer instruction as appropriate.
Enabling Objective. 1.2.4.1
Demonstrate programming a BASIC Channel (both PLAIN and Secure) while providing a context for when and why to use BASIC
Enabling Objective. 1.2.4.2
Demonstrate programming a SINCGARS channel and explain Frequency Hopping
Enabling Objective. 1.2.4.3
Demonstrate a channel SCAN and explain when and why to do it
Subordinate Enabling Objective. 1.2.4.1.1
Demonstrate selecting a channel number
Subordinate Enabling Objective. 1.2.4.2.1
Demonstrate selecting a channel number
Subordinate Enabling Objective. 1.2.4.1.2
Demonstrate selecting the appropriate encryption mode for BASIC
Subordinate Enabling Objective. 1.2.4.2.2
Demonstrate selecting the appropriate encryption mode for SINCGARS
Subordinate Enabling Objective. 1.2.4.1.3
Demonstrate entering the appropriate selections on the BASIC programming screens when provided with data to enter.
Subordinate Enabling Objective. 1.2.4.2.3
Demonstrate entering the appropriate selections on the SINCGARS programming screens when provided with data to enter.
Subordinate Enabling Objective. 1.2.4.1.4
Demonstrate establishing communications with a peer on this same channel
Subordinate Enabling Objective. 1.2.4.2.4
Demonstrate performing the FH Net Synch Time including entering Julian time and Zulu date
Subordinate Enabling Objective. 1.2.4.1.5
Demonstrate the proper corrective action in the event that communication was not established, while engaging other peers for assistance.
Subordinate Enabling Objective. 1.2.4.2.5
Demonstrate establishing communications with a peer on this same channel
Subordinate Enabling Objective. 1.2.4.2.6
Demonstrate the proper corrective action in the event that communication was not established, while engaging other peers for assistance.
Objective has been removed

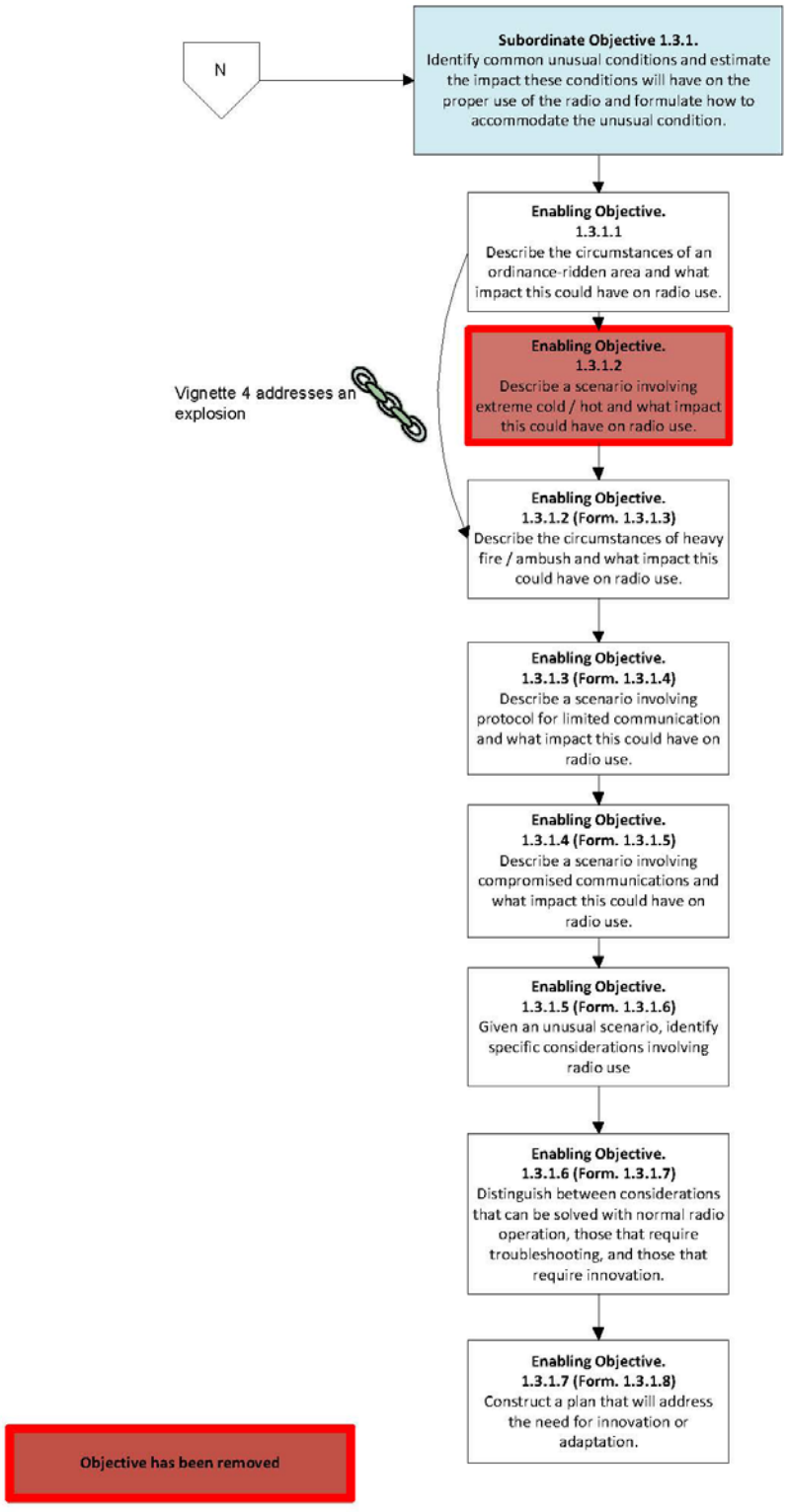


Objective has been removed

This objective has been added (taken from 1.2.6, which was eliminated).


L
Subordinate Objective 1.2 8.
Learner will demonstrate how to clone JEM's programming, while trouble-shooting as required, and will engage in story-telling and peer-to-peer interaction as appropriate.
Enabling Objective. 1.2.8.1
Share stories related to cloning, explaining when it was necessary and how it facilitated the situation.
Enabling Objective. 1.2.8.2
Demonstrate obtaining the proper equipment to clone two radios and set up the radios for SEND and RECEIVE
Enabling Objective. 1.2.8.3
Demonstrate powering on both radios and properly configuring the CLONE TX and CLONE RX on radios using the MODE screen.
Enabling Objective. 1.2.8.4
Demonstrate setting both radios for internal audio and enabling the Side Connector
In VC, this is combined with 1.2.8.3
Enabling Objective. 1.2.8.5
Demonstrate connection of the cloning cable to the SEND and RECEIVE radios using the proper end of the cloning cable
In VC, this is combined with 1.2.8.3
Enabling Objective. 1.2.8.6
Identify the screen display on both radios that indicates each radio is ready for cloning and execute the proper step to begin cloning.
In VC, this is combined with 1.2.8.6
Enabling Objective. 1.2.8.7
Identify the screen display on both radios that indicates that the radios are cloning. .
Enabling Objective. 1.2.8.8
Identify the screen display that indicates the cloning was not successful and demonstrate the appropriate corrective action.
In VC, this is combined with 1.2.8.6
Enabling Objective. 1.2.8.9
Demonstrate the proper steps to disconnect the cable from the RECEIVING radio in the correct timeframe
Enabling Objective. 1.2.8.10
Explain what happens if the RECEIVE radio is not disconnected timely and powered on.
In VC, this is combined with 1.2.8.6
In VC, this is combined with 1.2.8.1
Enabling Objective. 1.2.3.11
Explain which information will not be transferred to the RECEIVE radio and would need to be added.
Subordinate Enabling Objective. 1.2.8.11.1
Load COMSEC keys to RECEIVE Radio
Subordinate Enabling Objective. 1.2.8.11.2
Enter Julian Date and Zulu time in RECEIVE Radio for SINCGARS FH Channel Programming


M
Terminal Objective 1.3
Learner will demonstrate operation of the JEM, including troubleshooting as required, and evaluate other team members' use of the JEM through guidance, collaboration and after action review, in usual and unusual conditions.
Subordinate Objective 1.3.1.
Identify common unusual conditions and estimate the impact these conditions will have on the proper use of the radio and formulate how to accommodate the unusual condition.
N
Subordinate Objective 1.3.2.
Configure and manipulate the JEM properly and maintain communications in a scenario of usual conditions while troubleshooting as required.
O
Subordinate Objective 1.3.3.
Execute Guided practice and provide feedback to reach a successful conclusion of established communications, given a scenario of usual conditions.
Subordinate Objective 1.3.4
Configure and manipulate the JEM properly and maintain communications in a scenario of unusual conditions while troubleshooting and adapting as required.
Subordinate Objective 1.3.5.
Execute Guided practice and provide feedback to reach a successful conclusion of established communications, given a scenario of unusual conditions.


N
Subordinate Objective 1.3.1.
Identify common unusual conditions and estimate the impact these conditions will have on the proper use of the radio and formulate how to accommodate the unusual condition.
Enabling Objective.
1.3.1.1
Describe the circumstances of an ordinance-ridden area and what impact this could have on radio use.
Enabling Objective.
1.3.1.2
Describe a scenario involving extreme cold / hot and what impact this could have on radio use.
Vignette 4 addresses an explosion
Enabling Objective.
1.3.1.2 (Form. 1.3.1.3)
Describe the circumstances of heavy fire / ambush and what impact this could have on radio use.
Enabling Objective.
1.3.1.3 (Form. 1.3.1.4)
Describe a scenario involving protocol for limited communication and what impact this could have on radio use.
Enabling Objective.
1.3.1.4 (Form. 1.3.1.5)
Describe a scenario involving compromised communications and what impact this could have on radio use.
Enabling Objective.
1.3.1.5 (Form. 1.3.1.6)
Given an unusual scenario, identify specific considerations involving radio use
Enabling Objective.
1.3.1.6 (Form. 1.3.1.7)
Distinguish between considerations that can be solved with normal radio operation, those that require troubleshooting, and those that require innovation.
Enabling Objective.
1.3.1.7 (Form. 1.3.1.8)
Construct a plan that will address the need for innovation or adaptation.
Objective has been removed

O
Subordinate Objective 1.3.2
Configure and manipulate the JEM properly and maintain communications in a scenario of usual conditions while troubleshooting as required.
Subordinate Objective 1.3.3.
Execute Guided practice and provide feedback to reach a successful conclusion of established communications, given a scenario of usual conditions
Subordinate Objective 1.4.3
Configure and manipulate the JEM properly and maintain communications in a scenario of unusual conditions while troubleshooting and adapting as required.
Subordinate Objective 1.4.4.
Execute Guided practice and provide feedback to reach a successful conclusion of established communications, given a scenario of unusual conditions.
Enabling Objective. 1.3.2.1 Demonstrate proper assembly of the JEM and execution of the start up procedures
Enabling Objective. 1.3.2.2 Demonstrate Key Management Procedures
Enabling Objective. 1.3.2.3 Program radio parameters, including Julian date and time
Enabling Objective. 1.3.2.4 Program Radio Channels
Enabling Objective. 1.3.2.5 Recognize need for Radio Communications in a given scenario
Enabling Objective. 1.3.2.6 Successfully Establish Communications
Enabling Objective. 1.3.2.7 Troubleshoot any step as required
Enabling Objective. 1.3.3.1 Assist partner with proper assembly of radio and provide feedback
Enabling Objective. 1.3.3.2 Assist partner with proper key management procedures and provide feedback
Enabling Objective. 1.3.3.3 Assist partner with proper programming of radio parameters and provide feedback.
Enabling Objective. 1.4.2.4 Assist partner with programming radio channels and provide feedback.
Enabling Objective. 1.4.2.5 Prompt partner when there is a need for Radio Communications in a given scenario
Enabling Objective. 1.4.2.6 Prompt partner through troubleshooting actions as required.
Enabling Objective. 1.4.3.1 Recognize that conditions are unusual by articulating cues.
Enabling Objective. 1.4.3.2 Articulate a plan to establish or re-establish communications
Enabling Objective. 1.4.3.3 Successfully establish or re-establish communications through proper manipulation of the JEM.
Enabling Objective. 1.4.3.4 Troubleshoot or adapt as required
Enabling Objective. 1.4.4.1 Prompt partner with cues of unusual conditions.
Enabling Objective. 1.4.4.2 Assist partner with decisions in the planning process and provide feedback.
Enabling Objective. 1.4.4.3 Assist partner to successfully establish or re-establish communications through proper manipulation JEM.
Enabling Objective. 1.4.4.4 Provide guidance for troubleshooting and adaptation.

APPENDIX B

COLLABORATIVE SCENARIO – VIGNETTE SCRIPT

TRAIN II Assessments
Collaborative Scenario – Vignette Script

VIGNETTE 1 – ALL PLAYERS

Starting position – Top view of all Soldiers indoors at the FOB preparing for a mission. Pan across screen. Unit Commander is standing in front of the room. Seven Soldiers are seated in chairs in front of him (Non Player Characters (NPC): Truck Commander, Driver, Gunner, Convoy Commander, Players: RTO, two Soldier passengers). Eight radios are lined up on a table behind the Unit Commander. The Unit Commander will be holding a Commo card and a radio.

Start Action 1 – Switch to side scrolling view. Focus on Unit Commander, who is at the front of the room. Unit Commander begins to talk about the mission.

Sounds – Unit Commander says, "Our mission today is a PSD. We will be transporting the Colonel to a local village so he can check on the progress of a new school under construction. We will leave in approximately 2 hours. As you see behind me, all the radios are properly assembled and have been checked for any hardware problems. Your task will be to program all the channels for your radio based on the information on the Commo card and then clone the rest of the radios."

Continue Action 1 – Unit commander hands Soldier the Commo card and players are seated at the table where all the radios are. **Image fades.**

Background image: Black and white faded image of side view of all the Soldiers seated in the convoy room. At the bottom of the screen, image of three players, each respective player is highlighted with "You" just below the Soldier image.

Enter Text – Prepare your radio for the mission by completing all the necessary start-up procedures. Perform comms check. Clone a radio. You have 30 minutes. **Text fades. Vignette task list remains on screen in upper left corner. Current task is highlighted, completed tasks are checked off. Clock is displayed at bottom right corner, ticking down 30 minutes.**

Begin Radio Interaction – In center view of the screen, the radio appears. The player now has control of radio using mouse and keypad. Players can hear each other via headsets.

Radio Interaction*: The player is able to utilize the virtual keypad to manually program the radio according to the Commo card. Player must press the "submit" button when programming is complete. This is the correct answer.*

***Radio Interaction--Alternative**: **If length of time needed to program radio fully is deemed too long for this vignette, provide players with partially programmed radios.** The player is able to use the virtual keypad to manually program the channels that are yet to be entered according to the Commo card. Player must press the "submit" button when programming is complete. This is the correct answer.*

***Option 2 for Radio Interaction**: The player uses the virtual keypad to manually program the radio, but makes mistakes below a certain threshold. Player must press the "submit" button when programming is complete. This is an incorrect answer.*

Enter Text (for correct answer only) – You have successfully programmed the channels for your radio and performed the necessary communications checks. Now you may proceed to the cloning task.

Incorrect Answer / Time Runs out: Show areas for incorrect actions performed.

Start Action 2 – Scene continues in the room where the radios are being programmed. The other Soldiers present in the room are completing various radio tasks. Player has radio which he or she has already programmed, second radio, and cloning cable (may include other cables and accessories in the list). "Clone a radio" now highlighted on vignette task list.

***Radio Interaction**: The player must* program the radios first for cloning: TX and Receive, followed by attaching the cloning cable correctly and press PTT. *This is the correct answer.*

Incorrect Answer / Time Runs out / Partial Credit Answer: Display animated video of cloning the radio.

TRAIN II Assessments
Collaborative Scenario – Vignette Script

VIGNETTE 2 – MAIN PLAYER VIEW

Starting position – Top view of six passengers mounted in a vehicle on a dirt road. Driver NPC is seated in the Driver's Seat. Colonel NPC is seated in the passenger seat. Gunner is in position at center of vehicle. RTO player is seated in middle row behind Driver. Soldier player 1 is seated in middle row behind Colonel. Soldier player 2 is sitting in back row behind Driver. All players are equipped with radios that are attached with an external MIC (clipped to shoulder).

Start Action 1 – Vehicle moves north on the dirt road. Show vehicle coming to a stop. Show the RTO and Soldier players dismounting with the Colonel. **Image fades.**

Background image: Black and white faded image of side view of vehicle. At the bottom of the screen, Image of three players, the main player (Player 1) is highlighted with "You" just below the Soldier image.

Enter Text - Your convoy needs to assist another Battalion within a close distance. When you are about a half kilometer away, no one is able to communicate through the radio.

SHOW: Soldier reaching for the radio, attempts to make call, and then show that he is frustrated because he is unable to communicate. He keeps pushing on the PTT button but it appears to be stuck.

Enter Knowledge Check – What is the most likely reason why no one is able to communicate through the radio?

A. The battery is not properly connected.
B. The radios are set to different CTCSS tones.
C. The side connector is enabled.
D. Your radio has a "hot mic". Correct answer.
Question Fades.

Enter Knowledge Check – Which of the following functions could have prevented the "hot mic" situation?

A. Squelch.
B. Transmit (TX) Timeout. Correct answer.
C. Clear bypass reception.
D. Repeater delay.

Question Fades.

Enter Text. You now have 2 minutes to troubleshoot the situation. **Text fades.**

Begin Radio Interaction 1 – In center view of the screen, the radio and external mic appear fully assembled. The main player now has control of radio and external mic using mouse and mainpad. A clock is displayed at the bottom right corner of the screen, ticking down 2 minutes. Players can hear each other via headsets.

Option 1 for Radio Interaction*: The player is able to utilize the virtual mainpad to remove the external mic and then switch the radio to internal mic. The player presses the MODE key, and then presses ENT on INT AUDIO, then presses ENT again to confirm the selection. The player should then press ESC key to return to main screen. The player should verify that the headset icon is no longer on the screen. The player must press the "submit" button when the action is complete. This is the correct answer.*

Option 2 for Radio Interaction*: The player attempts to change the battery, power off the radio, reattach the antenna or change the programming of the radio. This is an incorrect answer.*

Incorrect Answer / Time Runs out: Display animated video of removing the external mic and switching the radio to internal mic.

VIGNETTE 2 – INACTIVE PLAYER VIEW

Starting position – Top view of six passengers mounted in a vehicle on a dirt road. Driver NPC is seated in the Driver's Seat. Colonel NPC is seated in the passenger seat. Gunner is in position at center of vehicle. RTO player is seated in middle row behind Driver. Soldier player 1 is seated in middle row behind Colonel. Soldier player 2 is sitting in back row behind Driver. All players are equipped with radios that are attached with an external MIC (clipped to shoulder).

Start Action 1 – Vehicle moves north on the dirt road. Show vehicle coming to a stop. Show the RTO and Soldier players dismounting with the Colonel. **Image fades.**

Background image: Black and white faded image of side view of vehicle. At the bottom of the screen, Image of three players, the inactive player (Player 2 / RTO or Player 3) is highlighted with "You" just below the Soldier image.

Enter Text - Your convoy needs to assist another Battalion within a close distance. When you are about a half kilometer away, no one is able to communicate through the radio.

SHOW: Soldier reaching for the radio, attempts to make call, and then show that he is frustrated because he is unable to communicate. He keeps pushing on the PTT button but it appears to be stuck.

Enter Knowledge Check – What is the most likely reason why no one is able to communicate through the radio?

A. The battery is not properly connected.
B. The radios are set to different CTCSS tones.
C. The side connector is enabled.
D. Your teammate's radio has a "hot mic". Correct answer.
Question Fades.

Enter Knowledge Check – Which of the following functions could have prevented the "hot mic" situation?

A. Squelch.
B. Transmit (TX) Timeout. Correct answer.
C. Clear bypass reception.
D. Repeater delay.
Question Fades.

Enter Text. The main player now has 2 minutes to troubleshoot the situation. **Text fades.**

The Main Player Begins Radio Interaction 1 – In center view of the screen, the radio and external mic appear fully assembled. The main player now has control of radio and external mic using mouse and mainpad. A clock is displayed at the bottom right corner of the screen, ticking down 2 minutes. Players can hear each other via headsets.

Option 1 for Radio Interaction*: The player is able to utilize the virtual mainpad to remove the external mic and then switch the radio to internal mic. The player presses the MODE key, and then presses ENT on INT AUDIO, then presses ENT again to confirm the selection. The player should then press ESC key to return to main screen. The player should verify that the headset icon is no longer on the screen. The player must press the "submit" button when the action is complete. This is the correct answer.*

Option 2 for Radio Interaction*: The player attempts to change the battery, power off the radio, reattach the antenna or change the programming of the radio. This is an incorrect answer.*

NOTE: For the inactive players, all above options have a top view (as if looking over one's shoulder).

Incorrect Answer / Time Runs out: Display animated video of removing the external mic and switching the radio to internal mic.

TRAIN II Assessments
Collaborative Scenario – Vignette Script

VIGNETTE 3 – MAIN PLAYER VIEW

Starting position – (Picking up from Vignette 2 — dismounted from the vehicle). Three Soldier passengers are dismounted and in the operational environment. Player 2 (RTO) and Player 3 are equipped with a radio that is attached with an external MIC (clipped to shoulder). Player 1 is equipped with a radio without the external MIC.

Start Action 1 – All players hear through their radio a code word: Blue Thunder.

Sounds - Play NPC voice saying "Blue Thunder" through the radio.

Background image: Black and white faded image of Soldier player 2 (RTO) frozen in the position of communication attempt. At the bottom of the screen, the main player (Player 2 / RTO) is highlighted with "You" just below the soldier image.

Enter Text – You have just heard a code word sent out through the higher headquarter indicating there has been a COMSEC compromise and everyone will now have to change the Julian date as a result. **Text fades.**

Enter Knowledge Check – What's the purpose of changing the Julian date in the case of a COMSEC compromise?

A. To avoid the interception of local radio frequencies.
B. To force the FH communications to be unsynchronized with the original Julian Date. Correct answer.
C. To adjust the length of time before the transmission automatically ends.
D. To force a pause during extended communications to enable all the radios to synchronize themselves. **Question Fades.**

Enter Text – Blue Thunder = 2456185.5. Begin working with the radio now to troubleshoot the issue. You have 2 minutes. **Text fades.**

Begin Radio Interaction – In center view of the screen, the radio appears. The player now has control of radio using mouse and keypad. The player must change the Julian date. A clock is displayed at the bottom right corner of the screen, ticking down 2 minutes. Players can hear each other via headsets.

***Option 1 for Radio Interaction**: The player changes the Julian date to the one provided in the text defining the code word. Player must start at the Default screen and must press ALT & MODE to access the MAIN MENU. Player must press ENT to access the Programming screen, and scroll using the Up arrow to outline the GLOBAL screen. When this option is outlined, player must press ENT. On the GLOBAL screen player must scroll down to outline SET CLOCK, then press ENT. Once on the SET CLOCK screen, the DAY option will be outlined. Player must press ENT to change the Julian Day. Use the Up and Down arrows to scroll through number values for the highlighted digit. To change the second digit, player must press ALT and either Up or Down Arrow, then use the Up or Down arrows to scroll through the values (0-9). When the correct Julian Date is set, player should press ENT. This is the correct answer.*

***Option 2 for Radio Interaction**: The player is unable to access the programming or global screens, etc. This is an incorrect answer.*

Incorrect Answer / Time Runs out: Display animated video of correctly changing the Julian date.

VIGNETTE 2 – INACTIVE PLAYER VIEW

Starting position – (Picking up from Vignette 2—dismounted from the vehicle). Three Soldier passengers are dismounted and in the operational environment. Player 2 (RTO) and Player 3 are equipped with a radio that is attached with an external MIC (clipped to shoulder). Player 1 is equipped with a radio without the external MIC.

Start Action 1 – All players hear through their radio a code word: Blue Thunder.

Sounds - Play NPC voice saying "Blue Thunder" through the radio.

Background image: Black and white faded image of Soldier player 2 (RTO) frozen in the position of communication attempt. At the bottom of the screen, the inactive player (Player 1 or Player 3) is highlighted with "You" just below the soldier image.

Enter Text – You have just heard a code word sent out through the higher headquarter indicating there has been a COMSEC compromise and everyone will now have to change the Julian date as a result. **Text fades.**

Enter Knowledge Check – What's the purpose of changing the Julian date in the case of a COMSEC compromise?

A. To avoid the interception of local radio frequencies.
B. To force the FH communications to be unsynchronized with the original Julian Date. Correct answer.
C. To adjust the length of time before the transmission automatically ends.
D. To force a pause during extended communications to enable all the radios to synchronize themselves. **Question Fades.**

Enter Text – Blue Thunder = 2456185.5. The RTO will now have 2 minutes to work with the radio to troubleshoot the issue. **Text fades.**

Main Player Begins Radio Interaction – In center view of the screen, the radio appears. The player now has control of radio using mouse and keypad. The player must change the Julian date. A clock is displayed at the bottom right corner of the screen, ticking down 2 minutes. Players can hear each other via headsets.

Option 1 for Radio Interaction*: The player changes the Julian date to the one provided in the text defining the code word. Player must start at the Default screen and must press ALT & MODE to access the MAIN MENU. Player must press ENT to access the Programming screen,*

and scroll using the Up arrow to outline the GLOBAL screen. When this option is outlined, player must press ENT. On the GLOBAL screen player must scroll down to outline SET CLOCK, then press ENT. Once on the SET CLOCK screen, the DAY option will be outlined. Player must press ENT to change the Julian Day. Use the Up and Down arrows to scroll through number values for the highlighted digit. To change the second digit, player must press ALT and either Up or Down Arrow, then use the Up or Down arrows to scroll through the values (0-9). When the correct Julian Date is set, player should press ENT. This is the correct answer.

***Option 2 for Radio Interaction**: The player is unable to access the programming or global screens, etc. This is an incorrect answer.*

NOTE: For the inactive players, all above options have a top view (as if looking over one's shoulder).

Incorrect Answer / Time Runs out: Display animated video of correctly changing the Julian date.

TRAIN II Assessments
Collaborative Scenario – Vignette Script

VIGNETTE 4 – MAIN PLAYER VIEW

Starting position – (Same as starting position in Vignette 3 — dismounted from the vehicle). All three players are dismounted with the Colonel (NPC) in the operational environment. Player 2 (RTO) and Player 3 are equipped with a radio that is attached with an external MIC (clipped to shoulder). Player 1 is equipped with a radio without the external MIC.

Start Action 1 – Start scene with side scrolling view with image of three players in the desert with the operational environment surrounding them. Included in the operational environment is a vehicle about ½ km away (not their own vehicle). Zoom to a full-body image of the main player (first-person view – the player is holding a radio looking at the vehicle in short distance). Off in the distance behind the Soldier, an explosion happens [include visual display of explosion as well as an audio]. The main player gets startled as he hears the explosion sound and then drops the radio.

Sounds – Play a loud explosion.

Continue Action 1 – Vehicle debris and shrapnel spreads from the explosion. Immediately after the explosion, an NPC is running towards the main player in the distance shouting for help.

Sounds – Play another NPC saying "Someone call MEDEVAC."

Continue Action 1 – The main player (first-person view) picks up radio and looks down at it. Zoom in to show that the battery is slightly twisted and radio is powered off. He reattaches the battery and powers on the radio. **Image fades.**

Background image: Black and white faded image of in the dessert with vehicle on fire in the background. At the bottom of the screen, image of three players, the main player (Player 3) is highlighted with "You" just below the Soldier image.

Enter Text – As you can see, your radio is powered off from the battery becoming loose. Answer this question. **Text fades.**

Enter Knowledge Check – What most likely happened to your radio during the explosion when the battery was disconnected?

A. COMSEC keys have been lost. Correct answer.
B. The radio overheated.

C. The Julian date was entered incorrectly.
D. Programming has been lost.
Question Fades.

Enter Knowledge Check – You need to use this radio to call MedEvac immediately. How should you proceed?

A. Run back to the truck to reload COMSEC keys.
B. Turn to the preprogrammed channel with the MedEvac frequency. Correct answer.
C. Program the radio and manually enter the MedEvac frequency in SINCGARS.
D. Activate an emergency beacon.
Question Fades.

Enter Text - You need to use this radio to call MedEvac immediately and have 1 minute to complete this task. **Text fades.**

Begin Radio Interaction – In center view of the screen, the radio appears. The main player now has control of radio using mouse and mainpad. A clock is displayed at the bottom right corner of the screen, ticking down 60 seconds. Players can hear each other via headsets.

Option 1 for Radio Interaction*: The player is able to utilize the virtual keypad to switch to the unsecure pre-programmed channel with the MedEvac frequency and press PTT. The player must select this option. This is the correct answer.*

Option 2 for Radio Interaction*: The player is also able to manipulate the power ON/OFF button to reboot the radio. The player may turn off the power, disconnect the battery, reconnect the battery, and then power the radio back on. This is an incorrect answer.*

Option 3 for Radio Interaction*: The player is also able to utilize the virtual keypad to activate the emergency beacon. The player may press MODE to open the menu. Then, he may highlight and select BEACON to activate the alarm. This is an incorrect answer.*

Option 4 for Radio Interaction*: The player is also able to utilize the virtual keypad to attempt to reprogram the radio. This is an incorrect answer.*

Incorrect Answer / Time Runs out / Partial Credit Answer: Display animated video of switching to the preprogrammed channel and calling MEDEVAC.

VIGNETTE 4 – INACTIVE PLAYER VIEW

Starting position – (Same as starting position in Vignette 3—dismounted from the vehicle). All three players are dismounted with the Colonel (NPC) in the operational environment. They are each equipped with a radio that is attached with an external MIC (clipped to shoulder).

Start Action 1 – Start scene with side scrolling view with image of three players in the desert with the operational environment surrounding them. Included in the operational environment is a vehicle about ½ km away (not their own vehicle). Zoom to a full-body image of the main player (second-person view). Off in the distance behind the Soldier, an explosion happens [include visual display of explosion as well as an audio]. The main player gets startled as he hears the explosion sound and then drops the radio.

Sounds – Play a loud explosion.

Continue Action 1 – Vehicle debris and shrapnel spreads from the explosion. Immediately after the explosion, an NPC is running towards the main player in the distance shouting for help.

Sounds – Play another NPC saying "Someone call MEDEVAC."

Continue Action 1 – The main player (second-person view) picks up radio and looks down at it. Zoom in to show that the battery is slightly twisted and radio is powered off. He reattaches the battery and powers on the radio. **Image fades.**

Background image: Black and white faded image of in the dessert with vehicle on fire in the background. At the bottom of the screen, image of three players, the inactive player (Player 1 & Player 2 / RTO) is highlighted with "You" just below the Soldier image.

Enter Text – As you can see, your teammate's radio is powered off from the battery becoming loose. Answer this question. **Text fades.**

Enter Knowledge Check – What most likely happened to your teammate's radio during the explosion when the battery was disconnected?

E. COMSEC keys have been lost. Correct answer.
F. The radio overheated.
G. The Julian date was entered incorrectly.
H. Programming has been lost.

Question Fades.

Enter Knowledge Check – Your teammate needs to use this radio to call MedEvac immediately. How should your teammate proceed?

E. Run back to the truck to reload COMSEC keys.
F. Turn to the preprogrammed channel with the MedEvac frequency. Correct answer.
G. Program the radio and manually enter the MedEvac frequency in SINCGARS.
H. Activate an emergency beacon.

Question Fades.

Enter Text – The main player needs to use this radio to call MedEvac immediately and has 1 minute to complete this task. **Text fades.**

Main Player Begins Radio Interaction – In center view of the screen, the radio appears. The main player now has control of radio using mouse and mainpad. A clock is displayed at the bottom right corner of the screen, ticking down 60 seconds. Players can hear each other via headsets.

Option 1 for Radio Interaction*: The player is able to utilize the virtual keypad to switch to the unsecure pre-programmed channel with the MedEvac frequency and press PTT. The player must select this option. This is the correct answer.*

Option 2 for Radio Interaction*: The player is also able to manipulate the power ON / OFF button to reboot the radio. The player may turn off the power, disconnect the battery, reconnect the battery, and then power the radio back on. This is an incorrect answer.*

Option 3 for Radio Interaction*: The player is also able to utilize the virtual keypad to activate the emergency beacon. The player may press MODE to open the menu. Then, he may highlight and select BEACON to activate the alarm. This is an incorrect answer.*

Option 4 for Radio Interaction*: The player is also able to utilize the virtual keypad to attempt to reprogram the radio. This is an incorrect answer.*

NOTE: For the inactive players, all above options have a top view (as if looking over one's shoulder).

Incorrect Answer / Time Runs out / Partial Credit Answer: Display animated video of switching to the preprogrammed channel and calling MEDEVAC.

TRAIN II Assessments
Collaborative Scenario – Vignette Script

VIGNETTE 5 – MAIN PLAYER VIEW

Starting position – (Picking up from Vignette 4—dismounted from the vehicle). Three players are dismounted and in the operational environment. Each player is equipped with a radio that is attached with an external MIC (clipped to shoulder).

Start Action 1 – Start scene with side scrolling view with image of three players in the desert with the operational environment surrounding them. Soldiers walk headed east towards their vehicle. They reenter the vehicle. Switch to top view.

Position (once at the vehicle) – Top view of six passengers mounted in a vehicle on a dirt road. Driver NPC is seated in the Driver's Seat. Colonel NPC is seated in the passenger seat. Gunner is standing on the platform directly behind between the Driver and the Colonel. Player 2 (RTO) is seated in middle row behind Driver. Soldier player 1 is seated in middle row behind Colonel. Soldier player 3 is sitting in back row behind Driver. Each of the players is equipped with a radio that is attached with an external MIC (clipped to shoulder).

Continue Action 1 – Vehicle moves north on the dirt road towards the village.

Sounds – Play Colonel saying, "You should do the key fill now."

Continue Action 1 – The RTO (first-person view) takes the SKL device out of his toolkit. **Image fades.**

Background image: Black and white faded image of Soldier passenger looking at the radio and SKL device. At the bottom of the screen, image of three players, the main player (Player 2 / RTO) is highlighted with "You" just below the soldier image.

Enter Text. Begin working with the radio now to reload the COMSEC keys. You have 10 minutes. **Text fades.**

Begin Radio Interaction 1 – In center view of the screen, the radio appears fully assembled. The main player now has control of radio using mouse and keypad. A clock is displayed at the bottom right corner of the screen, ticking down 15 minutes. Players can hear each other via headsets.

***Option 1 for Radio Interaction**: The player is able to manipulate the radio keypad. The player should prepare the radio for keyfill (access Keyfill Screen by pressing ALT+MODE), connect the Fill cable from the SKL device to the radio (the SKL device has already been prepared for the player), and press PTT to load keys. This is the correct answer.*

***Option 2 for Radio Interaction**: The player does not perform any of the necessary steps preparing the radio for COMSEC loading. This is an incorrect answer.*

***Option 3 for Radio Interaction**: The player either successfully prepares the radio OR successfully connects the Fill cable between the two devices. This is a partial credit answer.*

Incorrect Answer / Time Runs out / Partial Credit: Display animated video of correct procedure for preparing and loading COMSEC keys.

Start Action 2 – Top view of Soldier passenger looking down at the radio. Zoom to radio LCD to display keyfill error. Zoom back out to show Soldier passenger examining the radio. **Image fades.**

Enter Text - As you can see, there was an error when attempting to reload the COMSEC keys on your radio. Answer this question. **Text fades.**

Enter Knowledge Check – Select the most likely reason(s) why you are receiving the keyfill error message?

I. The o-ring is corroded. Correct answer.
J. The cable is damaged. Correct answer.
K. The battery is not secure.
L. The key is invalid.

Question Fades.

Enter Text. Begin working with the radio now to troubleshoot reloading the COMSEC keys. You have 5 minutes. **Text fades.**

Begin Radio Interaction 2 – In center view of the screen, the radio connected to the SKL device is shown. It's shown that there is an error message on the LCD screen. The main player continues to have control of radio using mouse and keypad. A clock is displayed at the bottom right corner of the screen, continuing the countdown of 15 minutes from previous interaction. Players can hear each other via headsets.

Option 1 for Radio Interaction*: The player is able to disconnect the keyfill cable and replace it with a spare cable (from his toolkit). Then he will access Keyfill Screen by pressing ALT+MODE and press PTT to load keys.* *This is the correct answer.* Show radio LCD saying "Fill Success."

Option 2 for Radio Interaction*: The player does not replace the keyfill cable.* *This is an incorrect answer.*

Incorrect Answer / Time Runs out: Display text "Correct action: Replace the damaged keyfill cable." **Text fades.**

VIGNETTE 5 – INACTIVE PLAYER VIEW

Starting position – (Picking up from Vignette 4 — dismounted from the vehicle). Three Soldier passengers are dismounted and in the operational environment. One Soldier is equipped with a radio that is attached with an external MIC (clipped to shoulder).

Start Action 1 – Start scene with side scrolling view with image of three players in the desert with the operational environment surrounding them. Soldiers walk headed east towards their vehicle. They reenter the vehicle. Switch to top view.

Position (once at the vehicle) – Top view of six passengers mounted in a vehicle on a dirt road. Driver NPC is seated in the Driver's Seat. Colonel NPC is seated in the passenger seat. Gunner is standing on the platform directly behind between the Driver and the Colonel. Player 2 (RTO) is seated in middle row behind Driver. Soldier player 1 is seated in middle row behind Colonel. Soldier player 3 is sitting in back row behind Driver. Each of the players is equipped with a radio that is attached with an external MIC (clipped to shoulder).

Continue Action 1 – Vehicle moves north on the dirt road towards the village.

Sounds – Play Colonel saying, "You should do the key fill now."

Continue Action 1 – The RTO (second-person view) takes the SKL device out of his toolkit. **Image fades.**

Background image: Black and white faded image of Soldier passenger looking at the radio and SKL device. At the bottom of the screen, image of three players, the inactive player (Player 1 or Player 3) is highlighted with "You" just below the soldier image.

Enter Text. The main player now has 60 seconds to reload the COMSEC keys. **Text fades.**

Main Player Begins Radio Interaction 1 – In center view of the screen, the radio appears fully assembled. The main player now has control of radio using mouse and keypad. A clock is displayed at the bottom right corner of the screen, ticking down 15 minutes. Players can hear each other via headsets.

Option 1 for Radio Interaction*: The player is able to manipulate the radio keypad. The player should prepare the radio for keyfill (access Keyfill Screen by pressing ALT+MODE), connect the Fill cable from the SKL device to the radio (the SKL device has already been prepared for the player), and press PTT to load keys. The player must select this option. This is the correct answer.*

Option 2 for Radio Interaction*: The player does not perform any of the necessary steps preparing the radio for COMSEC loading.* *This is an incorrect answer.*

Option 3 for Radio Interaction*: The player either successfully prepares the radio OR successfully connects the Fill cable between the two devices.* *This is a partial credit answer.*

NOTE: For the inactive players, all above options have a top view (as if looking over one's shoulder).

Incorrect Answer / Time Runs out / Partial Credit: Display animated video of correct procedure for preparing and loading COMSEC keys.

Start Action 2 – Top view of Soldier passenger looking down at the radio. Zoom to radio LCD to display keyfill error. Zoom back out to show Soldier passenger examining the radio. **Image fades.**

Enter Text - As you can see, there was an error when attempting to reload the COMSEC keys on your radio. Answer this question. **Text fades.**

Enter Knowledge Check – Select the most likely reason(s) why your teammate is receiving the keyfill error message?

A. The o-ring is corroded. Correct answer.
B. The cable is damaged. Correct answer.
C. The battery is not secure.
D. The key is invalid.

Question Fades.

Main Player Begins Radio Interaction 2 – In center view of the screen, the radio connected to the SKL device is shown. It's shown that there is an error message on the LCD screen. The main player continues to have control of radio using mouse and keypad. A clock is displayed at the bottom right corner of the screen, continuing the countdown of 15 minutes from previous interaction. Players can hear each other via headsets.

Option 1 for Radio Interaction*: The player is able to disconnect the keyfill cable and replace it with a spare cable (from his toolkit). Then he will access Keyfill Screen by pressing ALT+MODE and press PTT to load keys.* *This is the correct answer.* Show radio LCD saying "Fill Success."

Option 2 for Radio Interaction*: The player does not replace the keyfill cable. This is an incorrect answer.*

NOTE: For the inactive players, all above options have a top view (as if looking over one's shoulder).

Incorrect Answer / Time Runs out: Display text "Correct action: Replace the damaged keyfill cable." **Text fades.**

TRAIN II Assessments
Collaborative Scenario – Vignette Script

VIGNETTE 6 – MAIN PLAYER VIEW

Starting position – Scene begins by showing a small village in the desert. The three players and Colonel are walking towards a school house. Player 2 (RTO) and Player 3 are equipped with a radio that is attached with an external MIC (clipped to shoulder). Player 1 is equipped with a radio without the external MIC.

Start Action 1 – Start scene with side scrolling view. All three players and Colonel are walking towards a school house. Key player looks down at his radio upon hearing a sound.

Sounds – Play audible indicator sound that denotes low battery.

Background image: At the bottom of the screen, Image of three players, the main player (Player 1) is highlighted with "You" just below the soldier image.

Enter Text – Your convoy arrives at the Village. The Colonel is scheduled to meet with an Official to review the School House project. As you walk toward the school, you hear a sound from your radio.

Enter Knowledge Check – What does the audible indicator from your radio mean?

A. Transmit timeout warning.
B. Low battery. Correct answer
C. Crypto alarm.
D. Error alarm.
Question Fades.

Enter Text. You now have 3 minutes to address the audible indicator. Text fades.

Begin Radio Interaction 1 – In center view of the screen, the radio appears fully assembled. The main player now has control of radio using mouse and mainpad. A clock is displayed at the bottom right corner of the screen, ticking down 3 minutes. Players can hear each other via headsets.

Option 1 for Radio Interaction*: The player is able to utilize the mouse and virtual mainpad to change the battery. The player must power off the radio, detach the old battery, and attach the spare charged battery (To attach the External Battery to the JEM, hold the Battery perpendicular to the bottom of the radio. Twist the Battery clockwise 90 degrees or until it is locked into position), continue start-up procedures and then attempt to establish communications with truck (correct answer stops at push to talk).*

The player must select this option. This is the correct answer.

Option 2 for Radio Interaction*: Player tries to remove the battery without first powering it off; player attempts to reprogram the radio; the player attempts to remove the antenna; the player attempts to program the radio for keyfill, etc. These are incorrect answers.*

Incorrect Answer / Time Runs out / Partial Credit: Display animated video of changing the battery and establishing communication.

VIGNETTE 6 – INACTIVE PLAYER VIEW

Starting position – Scene begins by showing a small village in the desert. The three players and Colonel are walking towards a school house. Player 2 (RTO) and Player 3 are equipped with a radio that is attached with an external MIC (clipped to shoulder). Player 1 is equipped with a radio without the external MIC.

Start Action 1 – Start scene with side scrolling view. All three players and Colonel are walking towards a school house. Key player looks down at his radio upon hearing a sound.

Sounds – Play audible indicator sound that denotes low battery.

Background image: At the bottom of the screen, Image of three players, the inactive player (Player 2 / RTO or Player 3) is highlighted with "You" just below the soldier image.

Enter Text – Your convoy arrives at the Village. The Colonel is scheduled to meet with an Official to review the School House project. As you walk toward the school, you hear a sound from your teammate's radio.

Enter Knowledge Check – What does the audible indicator from your teammate's radio mean?

A. Transmit timeout warning.
B. Low battery. Correct answer.
C. Crypto alarm.
D. Error alarm.
Question Fades.

Main Player Begins Radio Interaction 1 – In center view of the screen, the radio appears fully assembled. The main player now has control of radio using mouse and mainpad. A clock is displayed at the bottom right corner of the screen, ticking down 60 seconds. Players can hear each other via headsets.

Option 1 for Radio Interaction*: The main player is able to utilize the mouse and virtual mainpad to change the battery. The player must power off the radio, detach the old battery, and attach the spare charged battery (To attach the External Battery to the JEM, hold the Battery perpendicular to the bottom of the radio. Twist the Battery clockwise 90 degrees or until it is*

locked into position), continue start-up procedures and then attempt to establish communications with truck (correct answer stops at push to talk).

The player must select this option. *This is the correct answer.*

Option 2 for Radio Interaction**: Player tries to remove the battery without first powering it off; player attempts to reprogram the radio; the player attempts to remove the antenna, etc.* *These are incorrect answer**s.

NOTE: For the inactive players, all above options have a top view (as if looking over one's shoulder).

Incorrect Answer / Time Runs out / Partial Credit: Display animated video of changing the battery and establishing communication.

TRAIN II Assessments
Collaborative Scenario – Vignette Script

VIGNETTE 7 – MAIN PLAYER VIEW

Starting position – (Picking up from Vignette 6 — dismounted from the vehicle and at the village). Top view of three players dismounted outside of the School House. The three players are waiting for the Colonel, who is inside of the School House in a meeting. Player 2 (RTO) and Player 3 are equipped with a radio that is attached with an external MIC (clipped to shoulder). Player 1 is equipped with a radio without the external MIC.

Start Action 1 – Start scene with side scrolling view. The Colonel exits the School House and approaches the Truck Commander.

Sounds –Play Colonel saying, "The inspection is complete. Radio back to the Truck and let them know we're returning."

Continue Action 1 – The main player (first-person view) grabs his radio and pushes PTT. While trying to make communication, he does not hear anything on the radio. He turns the channel and attempts to establish communication with another player nearby but is unsuccessful.

Sounds – Play other player saying, "I don't hear anything from you."

Background image: Black and white faded image of the main player looking at the radio. At the bottom of the screen, image of three players, the main player (Player 3) is highlighted with "You" just below the soldier image.

Enter Text – When trying to make communications with the truck, you were unable to establish communication. **Text fades.**

Enter Knowledge Check – Select the most likely reason(s) why you were unable to reach the truck on your radio?

M. The battery screws are loose.
N. The o-ring on the battery is damaged.
O. The antenna is damaged. Correct answer.
P. The antenna is not properly connected. Correct answer.

Question Fades.

Enter Text – You now have 5 minutes to solve this problem. **Text fades.**

Begin Radio Interaction 1 – In center view of the screen, the radio appears fully assembled. The main player now has control of radio using mouse and mainpad. A clock is displayed at the bottom right corner of the screen, ticking down 5 minutes. Players can hear each other via headsets.

Option 1 for Radio Interaction*: The player is able to disconnect the antenna, examines it, discovers that there's dirt in the connector, cleans it out and reattaches the antenna.*

The player must select this option. This is the correct answer.

Option 2 for Radio Interaction*: Player tries to remove the battery; player attempts to reprogram the radio; the player attempts to power off the radio, etc. These are incorrect answers.*

Incorrect Answer / Time Runs out: Display text: "Correct action: Clean out the antenna connector." **Text fades. May include any available clips of dirty vs. clean antenna connectors.**

VIGNETTE 7 – INACTIVE PLAYER VIEW

Starting position – (Picking up from Vignette 6—dismounted from the vehicle and at the village). Top view of three players dismounted outside of the School House. The three players are waiting for the Colonel, who is inside of the School House in a meeting. Player 2 (RTO) and Player 3 are equipped with a radio that is attached with an external MIC (clipped to shoulder). Player 1 is equipped with a radio without the external MIC.

Start Action 1 – Start scene with side scrolling view. The Colonel exits the School House and approaches the Truck Commander.

Sounds – Play Colonel saying, "The inspection is complete. Radio back to the Truck and let them know we're returning."

Continue Action 1 – The main player (second-person view) grabs his radio and pushes PTT. While trying to make communication, he does not hear anything on the radio. He turns the channel and attempts to establish communication with another player nearby but is unsuccessful.

Sounds – Play other player saying, "I don't hear anything from you."
Background image: Black and white faded image of the main player looking at the radio. At the bottom of the screen, image of three players, the inactive player (Player 1 or Player 2 / RTO) is highlighted with "You" just below the soldier image.

Enter Text – When trying to make communications with the truck, your teammate was unable to establish communication. **Text fades.**

Enter Knowledge Check – Select the most likely reason(s) why your teammate was unable to reach the truck on your radio?

A. The battery screws are loose.
B. The o-ring on the battery is damaged.
C. The antenna is damaged. This is the correct answer.
D. The antenna is not properly connected. This is the correct answer.

Question Fades.

Enter Text – The main player now have 5 minutes to solve this problem. **Text fades.**

Main Player Begins Radio Interaction 1 – In center view of the screen, the radio appears fully assembled. The main player now has control of radio using mouse and mainpad. A clock is displayed at the bottom right corner of the screen, ticking down 5 minutes. Players can hear each other via headsets.

Option 1 for Radio Interaction*: The player is able to disconnect the antenna, examines it, discovers that there's dirt in the connector, cleans it out and reattaches the antenna.*

The player must select this option. This is the correct answer.

Option 2 for Radio Interaction*: Player tries to remove the battery; player attempts to reprogram the radio; the player attempts to power off the radio, etc. These are incorrect answers.*

NOTE: For the inactive players, all above options have a top view (as if looking over one's shoulder).

Incorrect Answer / Time Runs out: Display text: "Correct action: Clean out the antenna connector." **Text fades. May include any available clips of dirty vs. clean antenna connectors.**

APPENDIX C

BETA TEST MATERIALS

JEM Training Research Assessment Project

Beta Test Directions & Feedback Form

January 2013

Developed for:
Army Research Institute
Orlando, FL
In conjunction with the Fort Gordon Signal School
Augusta, GA

Prepared By:
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9300 Lee Highway
Fairfax, VA 22031

What is the purpose of the JEM Training Research Assessment Project?
Over the past year, the Army Research Institute (ARI) and contracting firm ICF International (ICF) have developed prototypes for training Soldiers to use the JTRS Enhanced MBITR (JEM). The prototypes include trainings on a mobile device (tablet), a virtual classroom (on computer), and a collaborative, scenario-based exercise (also on a computer). Throughout the trainings, Soldiers are required to complete a number of different assessments to assess knowledge and learning. The primary goal of this project is to conduct research on training environments and assessments that are more Soldier-centered than most traditional Army training.

What is the purpose of the beta test?
For this beta test, ARI and ICF would like to have Soldiers try out the training and assessment prototypes. Specifically, you will be asked to complete all three trainings: the JEM Training Mobile Application, JEM Training Virtual Classroom, and JEM Training Collaborative Assessment. Within each of these trainings you will also be asked to complete a number of assessments. Your performance on the training and assessments will not be connected to your name in any way; the purpose of the beta test is to gather your feedback on the content of the training and assessment, as well as the usability of the technology. Data collected will be used for research purposes and to improve the content and user experience during the trainings.

In this packet, we have provided information about each JEM training and Feedback Forms for you to record your comments as you proceed through the trainings. ARI and ICF staff will be guiding you through the trainings and Feedback Forms, and observing throughout the day. Upon completion of the beta test, you will be debriefed and asked for final reactions to the trainings.

Who is the target audience for the JEM Training?
The target audience for these trainings is 25Us who have not yet taken the Advanced Leadership Course.

What is my role in reviewing the trainings?
We are sharing these prototypes with you in order to gather feedback on the general appearance / features, functionality, and organization of the trainings and assessments. Refer to the Feedback Forms in each section for systematically recording your comments.

Thank you for your time and support.

Demographic Questions

TIME IN MILITARY

How many total years of military service have you completed? (Include time in current and previous tours and services)

____ years

RANK

What is your current rank or grade?

( ) CW5	( ) CSM	( ) SSG
( ) CW4	( ) SGM	( ) SGT
( ) CW3	( ) 1SG	( ) SPC
( ) CW2	( ) MSG	( ) PFC
( ) WO1	( ) SFC	( ) PV2
		( ) PV1

TIME IN RANK

How many months have you served in your current rank, grade, or pay level?

____ months

MOS

What is your Military Occupational Specialty (MOS)?

( ) 25U Signal Support Systems Specialist
( ) Other (please specify): _____

DEPLOYMENTS

How many times have you been deployed? Include current deployment if applicable. Enter a whole number (e.g., 2).

Number of deployments: ____

RADIO TRAINING
For which of the following radios have you received training? (check all that apply)

( ) AN/PRC-25
( ) AN/PRC-77
( ) AN/PRC-117F (SATCOM)
( ) SINCGARS
( ) AN/PRC-148 V1/V2 (MBITR)
( ) AN/PRC-148 V3 or newer (JEM)
( ) AN/PRC-152
( ) AN/PRC-154
( ) Other(s) – Please specify _____

RADIO EXPERIENCE WHILE DEPLOYED
Which of the following radios have you operated while deployed? (check all that apply)

( ) AN/PRC-25
( ) AN/PRC-77
( ) AN/PRC-117F (SATCOM)
( ) SINCGARS
( ) AN/PRC-148 V1/V2 (MBITR)
( ) AN/PRC-148 V3 or newer (JEM)
( ) AN/PRC-152
( ) AN/PRC-154
( ) Other(s) – Please specify _____

MBITR EXPERIENCE
Have you used an MBITR or JEM prior to this training? If yes, how many months of experience do you have using an MBITR or JEM?

( ) Yes with ____ months of experience
( ) No

MBITR/JEM EXPERTISE

Rate your level of expertise using an MBITR/JEM (choose one answer that best describes your expertise).

( ) I have never used an MBITR/JEM
( ) I have used an MBITR/JEM for only standard communication
( ) I have used an MBITR/JEM and performed simple troubleshooting in usual circumstances to ensure I was able to communicate with others
( ) I have used an MBITR/JEM and performed advanced troubleshooting in unusual circumstances that involved adapting and making complex decisions

EXPERIENCE LOADING KEYS

Rate your level of experience loading keys on an MBITR/JEM (choose one answer that best describes your experience).

( ) I have never performed a keyfill on an MBITR/JEM and have never seen it being performed
( ) I have never performed a keyfill on an MBITR/JEM but I have seen it being performed
( ) I have performed a keyfill on an MBITR/JEM but it is not part of my usual duties
( ) I have performed a keyfill on an MBITR/JEM and it is part of my usual duties

Information about the Mobile Training

Structure

The JEM mobile training covers radio assembly, configuration, programming, operation, and troubleshooting. The training begins with a pre-test consisting of a series of questions designed to assess your prerequisite knowledge. Following the pre-test, you will access the training. It includes a site map that guides you through the training material. When you select a topic, expect the following to occur:

1. You will be introduced to training content in both written and auditory format.
2. You may be shown images or animated sequences on the screen (depending on the topic).
3. You will be able to select additional content or examples for the topic by clicking those named buttons. This content is only in written format.
4. For certain topics, you will have the opportunity to practice using a simulated radio. These practice opportunities are not scored.
5. If you have trouble with the practice, you can view a video demonstration

Assessments

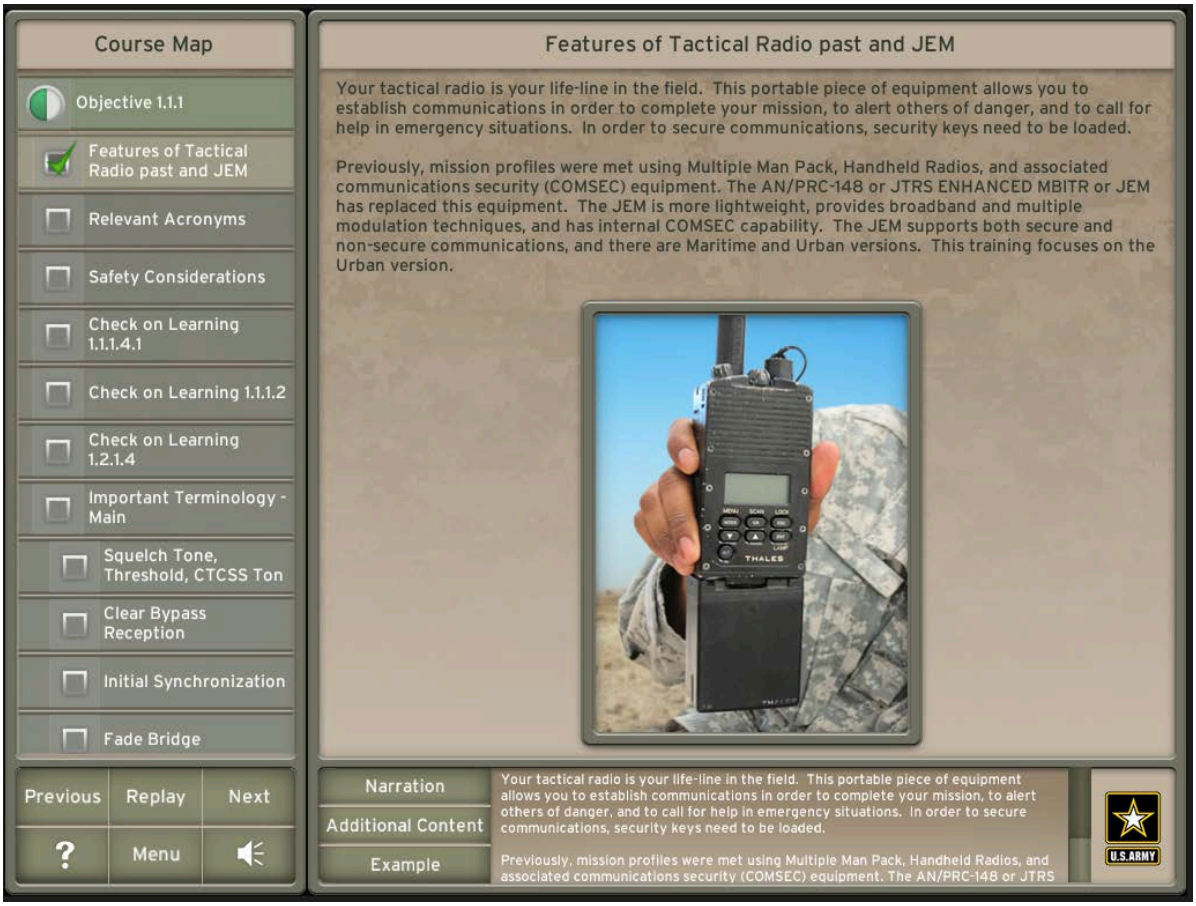
You will participate in the following types of assessments in the Mobile Application:

1. Computer Adaptive Pre-test prior to this training

2. Interim Check on Learning Assessments throughout this training
3. Computer Adaptive Post-test upon completion of this training

Navigate through the training

The training includes a navigation screen that will assist users in navigating the training as seen below:



Document any issues or comments you may have on the attached JEM Mobile Training Feedback Form

Utilize the JEM Mobile Training Feedback Form attached to provide comments on your experience with the Mobile training. Document any issues that you encountered.

JEM MOBILE TRAINING FEEDBACK FORM

Instructions for Completion Please read through these questions and keep them in mind while participating in the Mobile training. During the training, note any problems or errors related to these questions and describe them in the blank pages that follow.
Technical Issues
Did you experience any problems accessing the training?
Did you experience any problems during the training with accessing content?
Did you experience any problems during the training with interaction with the simulated radio?
Did you experience any problems when completing assessment items during the training?
Content and User Practice
Was the instructional material in this lesson accurate and current?
Was the simulated radio depicted in an accurate and current manner?
Was the functionality of the simulated radio accurate?
Was the content of the assessment items clear?
Instructional Design
Was the material presented in a logical sequence to help you understand the subject matter?
Were the assessment items during the training relevant to the training content previously presented?
Usability
After the pre-test, were you able to get started with the training with minimum assistance?
Were you able to successfully operate the simulated radio during practice opportunities?
Assessment items were presented in various formats. Did you have trouble understanding or responding to any of the formats?
Media
Did the media (i.e., graphics and animated sequences) appropriately illustrate the points being presented?
Did the simulated radio appropriately illustrate aspects of the radio assembly, configuration, programming, and operation?
Was the media (i.e., graphics, audio clips, animated sequences) included in assessment items appropriate?

JEM MOBILE TRAINING FEEDBACK FORM

Rank/Title/Position: _____ **Date of Review:** _____

JEM Training Mobile Application

Lesson Name	Detailed Description of Feature / Issue

Lesson Name	Detailed Description of Feature / Issue

Information about the Virtual Classroom

Structure

The JEM Virtual Classroom training covers radio assembly, configuration, programming, operation, and troubleshooting. You will find some overlap in content from the Mobile training; however, the Virtual Classroom allows you to interact with an instructor and to have more elaborate interactions with the simulated radio than you had in the Mobile training. During the Virtual Classroom, expect the following to occur:

1. Your Virtual Classroom instructor will be sharing his / her screen, and it will display on your screen.
2. You may be shown images or animated sequences on the screen (depending on the topic).
3. You will be able to indicate that you have a question for the Virtual Classroom Instructor.
4. If you have a question or have trouble understanding something during the training, you can chat with your Virtual Instructor or seek help from classroom peers using the chat function.
5. At any time, you can access a Knowledge Database using a key word that will provide you with text about that topic.

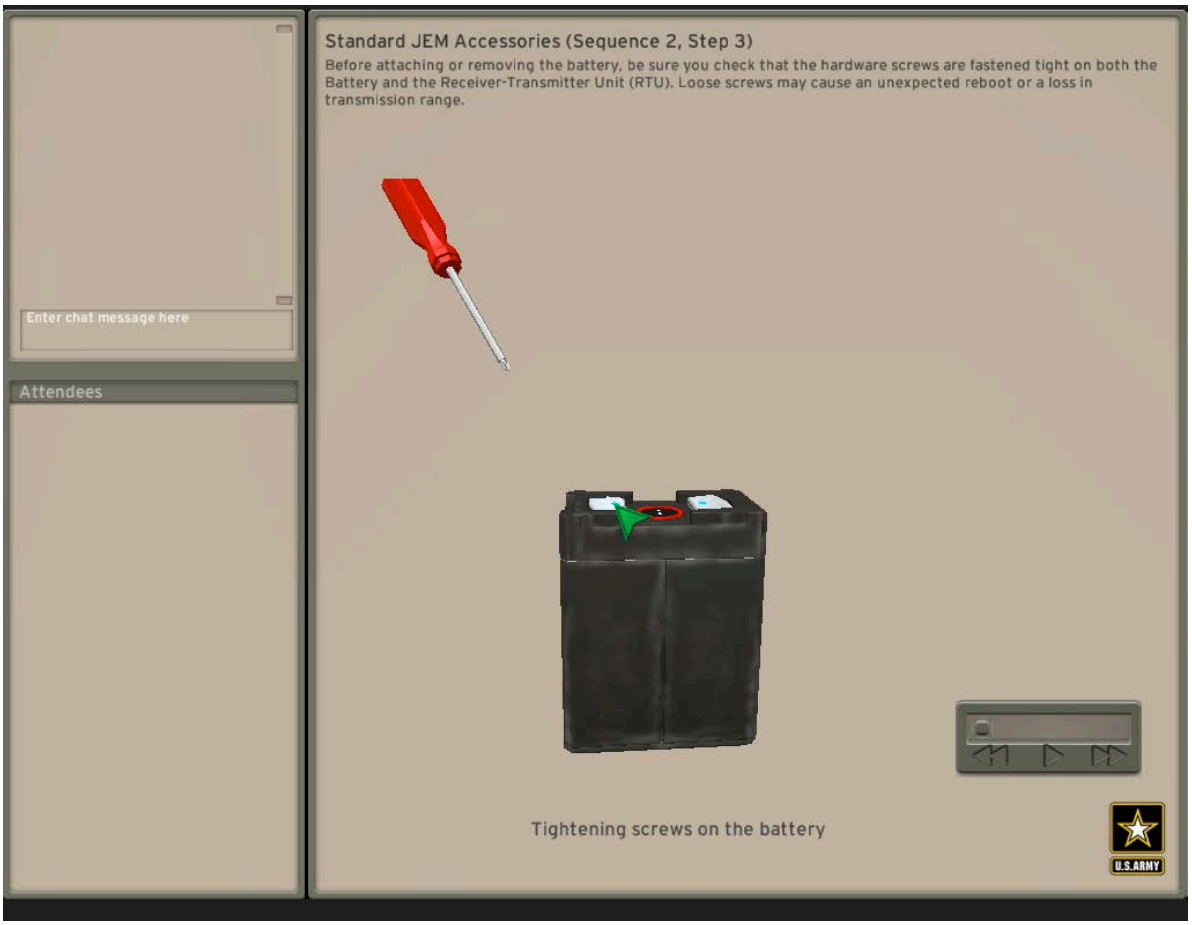
Assessments

You will participate in the following types of assessments in the Virtual Classroom:

1. Interim Check on Learning Assessments throughout this training- these may involve interaction with the simulated radio
2. Computer Adaptive Post-test upon completion of this training

Navigate through the training

The image seen below is the user interface for the Virtual Classroom:



Document any issues or comments you may have on the attached JEM Virtual Classroom Feedback Form

Utilize the JEM Virtual Classroom Feedback From attached to provide comments on your experience with the Virtual Classroom. Document any issues that you encountered.

JEM VIRTUAL CLASSROOM FEEDBACK FORM

Instructions for Completion Please read through these questions and keep them in mind while participating in the Virtual Classroom. During the Virtual Classroom, note any problems or errors and describe them in the blank pages that follow.
Technical Issues
Did you experience any problems entering the Virtual Classroom?
Did you experience any problems during the training?
Did you experience any problems when completing assessment items during the training?
Content and User Practice
Was the instructional material in this training accurate and current?
Was the simulated radio depicted in an accurate and current manner?
Was the functionality of the simulated radio accurate?
Was the content of the assessment items clear?
Instructional Design
Was the material presented in a logical sequence to help you understand the subject matter?
Were the assessment items during the training relevant to the training content previously presented?
Usability
Were you able to use the Virtual Classroom functionalities (i.e. question and chat function) with minimum assistance?
Were you able to successfully operate the simulated radio during practice opportunities?
Assessment items were presented in various formats. Did you have trouble understanding or responding to any of the formats?
Media
Did the media (i.e., graphics and animated sequences) appropriately illustrate the points being presented?
Did the simulated radio appropriately illustrate aspects of the radio assembly, configuration, programming, and operation?
Was the media (i.e., graphics, audio clips, animated sequences) included in assessment items appropriate?

JEM VIRTUAL CLASSROOM FEEDBACK FORM

Rank/Title/Position: _____ **Date of Review:** _____

JEM Training Virtual Classroom

Lesson Name	Detailed Description of Feature/Issue

Lesson Name	Detailed Description of Feature/Issue

Information about the Collaborative Assessment

Structure

The Collaborative Assessment places you and two other team members in real-to-life situations involving the JEM through Virtual Reality experience. The assessment is based on a single mission with 7 different situations within that mission. For each situation, one key player on the team will be actively operating the simulated radio, while the other two team members will remain available to assist through voice chatting capabilities. During the Collaborative Assessment, expect the following to occur:

1. You and your team will be viewing the same screen showing the Virtual Reality and active player avatar.
2. All team members will be provided a situation and asked to answer multiple choice questions individually prior to the active player engages in simulated radio manipulation tasks. You will not receive feedback on this question.
3. The active player will be able to access and manipulate the simulated radio (through a series of interfaces) in order to successfully accomplish the task at-hand. Inactive team members will not be able to access and manipulate the simulated radio.
4. Each task will have a specified time limit.
5. The active player can communicate with or receive verbal assistance from other team members.
6. The active player must click the “submit” button to submit his or her action or he or she can reset any actions and re-do them differently if the submit button has not yet been selected and time has not yet run out.
7. If the submitted action is correct, your team moves on to the next situation.
8. If the submitted action is not correct or you run out of time before submitting the action, your team will see an animated video of the correct answer before moving on to the next situation

Navigate through the training

The image seen below is the user interface for the collaborative assessment:

Document any issues or comments you may have on the attached JEM Collaborative Assessment Feedback Form

Utilize the JEM Collaborative Assessment Feedback Form attached to provide comments on your experience with the Collaborative Scenario. Document any issues that you encountered.

JEM COLLABORATIVE ASSESSMENT FEEDBACK FORM

Instructions for Completion Please read through these questions and keep them in mind while participating in the Collaborative Assessment. During the Collaborative Assessment, note any problems or errors and describe them in the blank pages that follow.
Technical Issues
Did you experience any problems accessing the Collaborative Assessment?
Did you experience any problems during the assessment?
Content and User Practice
Were the situations presented in the Collaborative Assessment appropriate in terms of accuracy and feasibility?
Was the simulated radio depicted in an accurate and current manner?
While manipulating the radio, was the functionality of the radio accurate?
Instructional Design
Were the situations presented in a logical sequence to render the scenario realistic?
Were you prepared to perform the actions presented in the situations based on what you had learned in the Mobile or Virtual Classroom?
Usability
Were you able to communicate with team members without technical issues?
Were you able to successfully operate the simulated radio when you were the active player?
Did you understand what you needed to do from a technical standpoint in order to complete each assessment? For example, were you ever in a situation where you felt you knew the correct answer or solution and were unable to execute it due to technical issues?
Did you find access to the various interfaces intuitive? (radio accessories bag, keypad, etc.)

JEM COLLABORATIVE ASSESSMENT FEEDBACK FORM

Rank/Title/Position: _____ **Date of Review:** _____

JEM Training Collaborative Assessment

Scenario	Detailed Description of Feature/Issue

Scenario	Detailed Description of Feature/Issue

Debriefing Questions

1. Did you find the trainings more or less helpful than traditional classroom learning?

2. Did you find the technology to be easy to understand and use?

3. What, if anything, would you change about the trainings and assessments?

4. Please provide any additional comments you have about the trainings.

APPENDIX D

ONLINE REACTION QUESTIONNAIRE ITEMS

Dimension	Item	Format
Usability	The technology interface was easy to use.	5-point disagree / agree scale
Usability	The technology allowed for easy review.	5-point disagree / agree scale
Usability	I was able to access the training with minimum assistance.	5-point disagree / agree scale
Usability	I was able to successfully operate the functionality within the training.	5-point disagree / agree scale
Usability	I am satisfied with the technology interface.	55-point disagree / agree scale
Content/ISD	The session objectives were met.	5-point disagree / agree scale
Content/ISD	The material in this lesson was accurate and current.	5-point disagree / agree scale
Content/ISD	The design of the training was an effective way to present the subject matter?	5-point disagree / agree scale
Content/ISD	The material was presented in a logical sequence so that it helped me understand the subject matter.	5-point disagree / agree scale
Content/ISD	The media (i.e., graphics and animated sequences) appropriately illustrate the points being discussed.	5-point disagree / agree scale
Content/ISD	The design and presentation of material motivated me to learn.	5-point disagree / agree scale
Content/ISD	Overall, I am pleased with the way the training was presented.	5-point disagree / agree scale
Perceived Learning	Learning this material was fun.	5-point disagree / agree scale
Perceived Learning	Please rate the following:	
	My knowledge of the subject PRIOR to taking this lesson:	5-point poor / excellent scale

	My knowledge of the subject AFTER to taking this lesson:	5-point poor / excellent scale
	My ability to apply the strategies and techniques presented to an actual situation in this subject area PRIOR to taking this lesson:	5-point poor / excellent scale
	My ability to apply the strategies and techniques presented to an actual situation in this subject area AFTER to taking this lesson:	5-point poor / excellent scale
Perceived Learning	To what do you attribute the differences in your PRIOR and AFTER responses?	Open-ended
Perceived Learning	Overall, I have learned a lot from this training.	5-point disagree / agree scale
Value/Utility	It is clear to me that the people conducting the training understand how I will use what I learn.	5-point disagree / agree scale
Value/Utility	This training was relevant to my job in the Army.	5-point disagree / agree scale
Value/Utility	I believe the training will help me do my current job in the Army better.	5-point disagree / agree scale
Value/Utility	I learned something I can apply immediately to my work in the Army.	5-point disagree / agree scale
Value/Utility	I plan to use what I learned on my job in the Army.	5-point disagree / agree scale
Value/Utility	I get excited when I think about trying to use my new learning on my job in the Army.	5-point disagree / agree scale
Value/Utility	The training materials will be available for me to use on my job in the Army.	5-point disagree / agree scale
Value/Utility	I will be using the equipment on my job in the Army after the training.	5-point disagree / agree scale
Value/Utility	The training was of practical value to me.	5-point disagree / agree scale
Satisfaction	I enjoyed this training program.	5-point disagree / agree scale
Satisfaction	My time on the training was well spent.	5-point disagree / agree scale

Satisfaction	I would recommend this training program to other Soldiers.	5-point disagree / agree scale
	What, if anything, would you change about the training?	Open-ended
	Please provide any additional comments you have about the training.	Open-ended
Technical Issues	Did you experience any problems accessing the training?	Yes / No
Technical Issues	If yes, please describe.	Open-ended